PRODUCTS finishing

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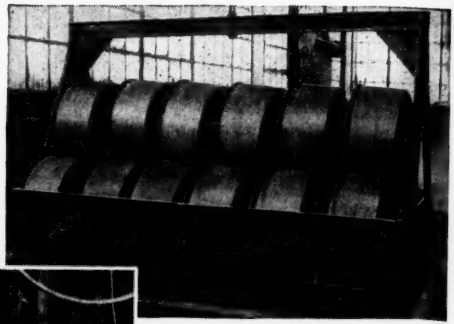

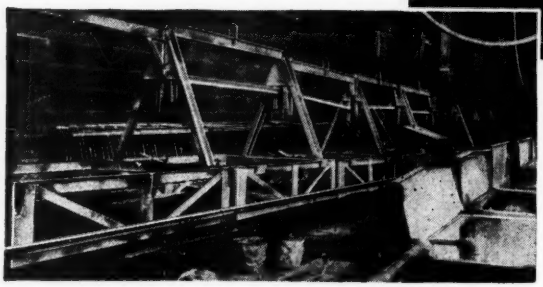

Washing machine drums in Monel pickling basket at plant of Mullins Manufacturing Corporation, Salem, Ohio. Spacers are made of Monel also. These pickling baskets have been in service for 10 years and have handled an average of 400,000 tubs per year over that period.

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CINCINNATI, OHIO VOL. 3, NO. 12

SEPTEMBER, 1939

PREFINISHING CONSTRUCTIONAL METALWORK

Several finishing processes employed by plants in England where prefabrication and prefinishing operations have been keyed up to maximum production are described in the following article.

By E. E. HALLS
New Barnet, Herts, England

IN THIS era of standardization and mass production, much constructional ironwork is fabricated into units in the factory and shipped to the place of erection. Many articles for building and architectural purposes are produced in this manner to the general benefit of manufacturer and consumer. The latter finds the advantage in precise and standardized sizes, prompt delivery as required, simplified erection, and in many applications a more solid and permanent product than obtained by other means. Steady or increasing demand enables the manufacturer to establish methods for improvement of product and to develop new designs and lines. Factory completion of units carries with it an advantage which is not always realized; iron and steel can be treated in one of many ways for rustproofing, for ensuring paint adhesion or for both of these purposes. The choice of process depends upon the type of work to be treated, the destination with respect both to climatic conditions and to internal or external service, as well as upon economic considerations.

One of the most widely useful treatments is the chemical one broad-

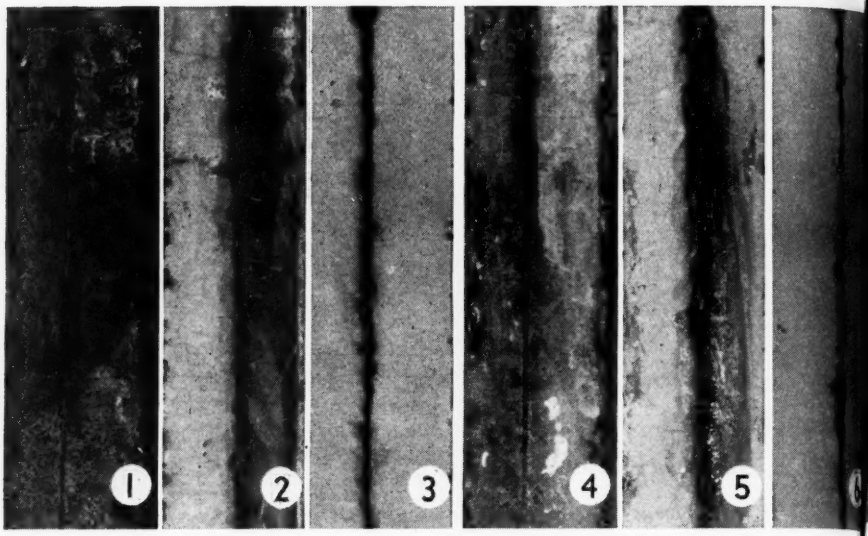
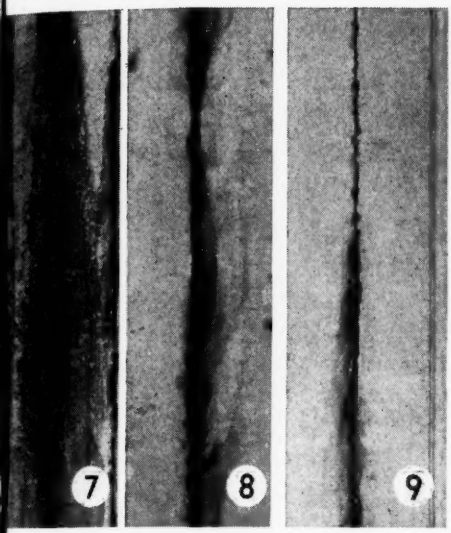


Fig. 1—Illustration showing test specimens following various methods of treatment described in this article.

ly designated "phosphatization." This has been known in principle for many years as Coslettizing or Parkerizing, but development work during the last decade has resulted in other processes which yield a uniform product, rapid and economic treatment, as well as a range of types of processes from which to select the most suited to the work in question. It is proposed to deal briefly with the phosphate processes, their advantages and limitations, in order to give some idea of their possibility and suitability for iron and steel works in which architects and builders are interested. Window frames, gates, hand rails, signs, and figures are typical products involved; in fact, any of the light iron or steel works which require paint coatings.

Iron and steel in the form of flats or sections represents perhaps the bulk of the raw material involved. Some of this will be in a cold rolled or drawn bright condition but much of it will be "black," having irregular surface scale. Fabrication into the product, through processes of cutting, bending, drilling, riveting and welding, creates the condition whereby contamination occurs from lubrication, swarfe, welding scale, and incidental rusting. First attention in the finishing shop has to be given to cleaning, and this applies whatever the finishing processes adopted. Surface conditioning automatically falls into two sections. The first of these is degreasing, for which trichlorethylene solvent processes or aqueous alkaline methods are available. The second concerns the removal of rust and scale, for which mechanical means such as sand or shot blasting, or wire brushing, or chemical pickling solutions are employed. When phosphatizing is not resorted to, but paint is applied directly to the metal, aqueous solution



treatments are often avoided, partly on account of their nature, and partly to eliminate any possibility of the retention of chemicals in crevices or seams, and the avoidance of consequent corrosion therefrom. In these circumstances solvent degreasing and mechanical cleaning are adopted. If sand or shot blasting is chosen for the latter, it serves as a good basis for paint, but while it provides for adhesion, it offers an easily rustable surface because of its cleanliness and mattness. Consequently, priming must be effected rapidly after abrasive blasting and must be efficient. For this reason, abrasive treatment is passed over in favor of wire brushing which removes rust and loose scale, and merely burnishes adherent scale. Brushing machines which achieve this effectively are available. Thus, an increase in rusting propensities is avoided, and moreover the scale in itself can provide good protection against corrosion, although some extra attention is warranted in selecting the primer with respect to its adhesive characteristics.

Work satisfactorily finished as just described may be primed in the factory and finished on site, or completely finished in the factory. Air drying or stoving media will be employed according to availability of equipment. In both cases, a carefully selected primer is necessary, chosen rationally with regard to its coverage, adherence and flexibility as well as with respect to its capabilities of preventing rust formation and rust spread. Surfacing, filling, and finishing coats would depend upon the class of work.

Consequently, it is immediately apparent that phosphatizing is something additional with respect to finishing, and therefore, something for which positively apparent benefits must be forthcoming in order to justify the expenditure.

The phosphatizing operation itself consists in the immersion of the work in an aqueous solution of the necessary chemicals at a controlled temperature and for a specified time. Temperatures range from 170 deg. to 210 deg. F., and time from three minutes to several hours according to the type of solution used and the heaviness of coating required. A thorough water wash follows. For many types of work, a spray process is adaptable, in which work can be passed by conveyor through a series of chambers and subjected successively to the action of sprays for alkali washing, water rinsing, phosphatizing and water rinsing. Solutions in all processes have to be rigorously maintained by periodic analysis. Phosphatization results in the conversion of the surface of the work into iron phosphate, which is adherent and porous, and therefore a sound base for paint. Also, all modern phosphate treatments include, after the final wash, a rinse in very dilute chromic acid solution, which is dried into the

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coating. This, in conjunction with the iron phosphate, imparts to the coating specific properties of opposing rust formation and rust spreading, although extraordinary though it may seem, these valuable properties are not apparent until a coating of organic medium is applied. In short, phosphatized coatings readily rust and must be primed shortly after their application; the phosphatized, painted work exhibits combined properties of adhesion and rust resistance which are not readily obtained by other means.

Aqueous alkali cleaning and acid pickling can be used in conjunction with phosphatizing processes if preferred and a final drying out in an oven prior to priming in order to render any chemicals entering seams relatively immune. Scale is often ignored, and phosphatization "takes" satisfactory oven scale, the only warning needed being to the effect that if subsequently it chips from mechanical blows, "bare" metal is revealed.

The long period immersion phosphatization would be reserved for heavy section work, or for articles intended for severe service. The short period processes are sufficient for light section material and for normal service; they are preferable for flexible metalwork because the heavily built-up coatings produced in long treatments do not withstand flexing or bending.

The processes involved are briefly set out for comparison below:

Without Phosphatization

1. Degrease by (a) aqueous alkali or (b) solvent process
2. De-rust by (a) acid pickling or (b) abrasive blasting or (c) scratch brushing
3. Primer, special anti-rust medium
4. Fill and surface as required
5. Finish as required

With Phosphatization

1. As without phosphatization
2. As without phosphatization
3. Phosphatize
4. Fill and surface as required
5. Finish as required

From this tabulation, it would seem that phosphatization replaced the anti-rust priming. This is, broadly speaking, correct but warrants some qualification. It performs the same functions of resisting rust formation and rust spread, and of providing adhesion to the finish as a whole. The last of these it does rather better than the anti-rust primer, but its most important advantage is that it enables the finish to retain its adhesion, whereas the primer alone shows gradual diminishment in adhesion with time. On the other hand, phosphatization fails by itself as it exhibits no rust-proofing characteristics until coated with an organic medium. Consequently, work that would normally be shipped for erection on site in a primed condition, if phosphatized, must still be primed or given an application of first coating material. Incidentally, a combination of phosphatization and rust inhibitive primer yield very good service in the field, combining the good features of both.

The value of phosphatization can be seen by test data, and the following series, illustrated in Fig. 1, are of interest. A number of lengths of black steel sections were prepared and finished. Cleaning was common to all specimens, namely, degreasing in trichlorethylene and wire brushing to remove rust and scale. Additionally, specimens were shot blasted for half their length. They were then finished in the following manners, phosphate treatments being by immersion and all the organic coatings being applied by spray and allowed to air dry:

Specimen No. 1. One coat of paint.

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Specimen No. 2. 10-min. phosphate process and one coat of paint.

Specimen No. 3. 60-min. phosphate process and one coat of paint.

Specimen No. 4. Two coats of paint.

Specimen No. 5. 10-min. phosphate process and two coats of paint.

Specimen No. 6. 60-min. phosphate process and two coats of paint.

Specimen No. 7. Red oxide anti-rust primer and one coat of paint.

Specimen No. 8. 10-min. phosphate process, red oxide primer and one coat of paint.

Specimen No. 9. 60-min. phosphate process, red oxide primer and one coat of paint.

The specimens were left for a week to fully harden prior to testing. They were then scratched through to the base metal along a main surface in order to accelerate deterioration under test conditions, and submitted to a 20 per cent salt spray test for a period of 100 days, washing, drying, and examining each day. The photographs reproduced are typical specimens which give a good comparative picture of performance. The progress of the deterioration of the specimens can very briefly be summarized as follows:

Specimens Having One Coat of Paint

No. 1. Started to rust in several days and was very bad in four days, with very little paint left in 15 days.

No. 2. Showed rust spots at edges in two days, and generally in 20 days. In 100 days, condition was poor but paint was still adherent despite rust patches, lines, and spots.

No. 3. A fair number of rust spots appeared within 20 days, and spread of rust from scratch, but little further deterioration occurred in 100 days, when condition was still very good.

Specimens Having Two Coats of Paint

No. 4. Rusting started at spots and edges in two days, gradually developing to very poor condition in 40 days, very little paint left.

No. 5. Rust spread from scratch and from edges was marked in 20 days, but condition still good in 100 days.

No. 6. This showed only slight rust spread from scratch, a little from edges and at a few points in 100 days. Exceedingly good condition.

Specimens Having Two Coats, One of Red Oxide Primer, One of Paint

No. 7. Twenty days revealed considerable rusting from edges and from the scratch, 40 days appreciable blistering. In 100 days condition was rather poor, but performance markedly better than that of specimen No. 4 having two coats of paint.

No. 8. In the 100 days showed some rust spread from scratch and some at edges. Condition very good and superior to that of the specimen having the same pretreatment and two coats of paint (No. 5).

No. 9. This was even superior to No. 8, and in 100 days was practically unaffected except for slight rust spread from scratch. It was superior to its equivalent with two coats of paint (No. 6).

It was found that little difference was caused by the shot blasting. Again it is stressed that paint adhesion at the end of the test was excellent on all phosphated samples, but, with respect to the other samples, adhesion was indifferent where a red oxide primer was used, and hopeless in other cases.

The salt spray test represents very severly corrosive exposure conditions, and consequently phosphate rust-proofing must be considered to prove

its value for outdoor service. It must, of course, be remembered that phosphate coatings are only rust preventatives in conjunction with the applied finish and are not of any value by themselves. The illustrations establish that they do prevent rust spread to a remarkable extent as well as retarding its production. But the tests emphasize a feature often overlooked: phosphate coatings retard deterioration of paint coatings in an extraordinary manner. The long immersion treatments are more effective than short period treatments. Two coats of paint over phosphatization are disproportionately superior to single coats, while an inhibitive primer such as red oxide adds its own meritorious features to the combination.

In conclusion, it is claimed that phosphatization cannot be ignored for the class of work in question. A choice of treatments is available to suit work and conditions. Complete finishing, or priming only, can be executed before shipment. The resultant finish will be weather resistant and in addition, will usefully withstand adverse storage and transit, both with respect to atmospheric conditions and mechanical handling.

New Wrinkles in Finishing, Volume One, Number Four. Wrinkle finishes in color are featured in this issue of the New Wrinkle house organ now being issued by New Wrinkle, Inc., Mutual Home Bldg., Dayton, Ohio. Actual color reproductions are shown and descriptions of their application on various products are included.

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HEATING ELECTROPLATING BATHS WITH IMMERSION HEATERS

By F. W. McCHESNEY
Industrial Department, General Electric Company, Schenectady, N. Y.

IN THE process of electrodeposition of metal, an actual migration of metallic ions from an anode through an electrolytic solution to a cathode takes place. One of the effects of the heating of the electrolytic solution is to increase the mobility of the ions and thus decrease the resistivity of the setup. Increasing the temperature of an electrolyte decreases its resistivity by about two per cent for each degree Centrigrade of temperature rise. Therefore, where the use of warm solutions produces deposits having the desired properties, heating the solution may prove very economical from the standpoint of power consumption.

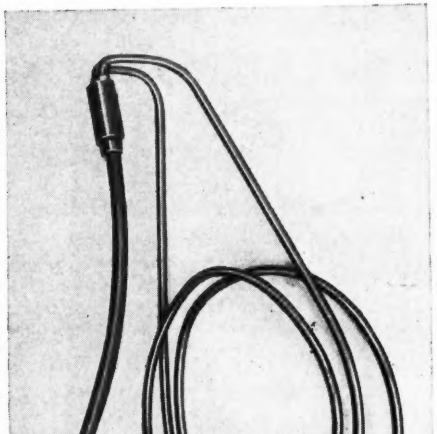

Fig. 1—Steel-sheath immersion unit

Authorities agree that the effects of heating an electroplating solution are numerous and varied. Some are advantageous and some are detrimental. For any particular plating condition, however, there is generally some one best temperature condition. The best temperature is most frequently somewhat above room temperature; consequently, some source of heat for the plating solutions is needed for obtaining best results.

The effect of increasing the temperature of the electrolyte is, in general, to stimulate crystal growth rather than to form new nuclei. The metallic deposit in a warm solution is likely to be more regular because differences in concentration of the electrolyte are less. Irregularities, if produced, develop less rapidly than in cold solutions, since the electrolyte has greater conductivity and current

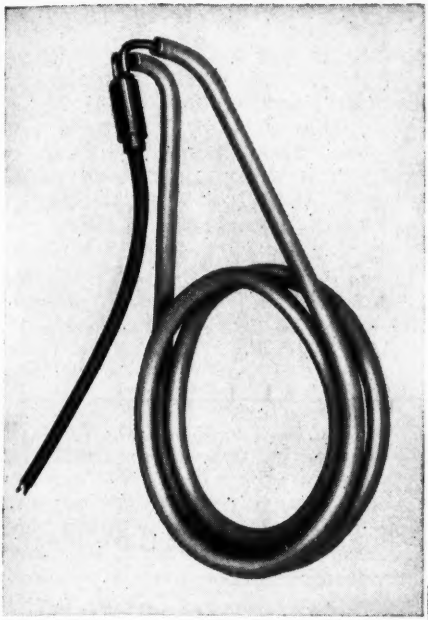

Fig. 2—A unit of the lead-sheath immersion type

lines are less strongly drawn toward a protruding point. Moderate temperature will, in most cases, tend to give smoother and more coherent deposits, but a grain usually somewhat coarser. The correct temperature is plainly, therefore, a compromise.

Warm solutions are commonly used for the following reasons:

1. The increased solubility of the salts permits higher concentration and consequently higher current densities without seriously reducing the metal content of the solution near the cathode.

2. The increased conductivity reduces the tendency to "treeing," or building up of deposits in spots, and also produces higher current densities at a given voltage, which factors tend to reduce crystal size.

3. The occlusion of hydrogen is decreased. Hydrogen occlusion is one of the common causes of cracked deposits, especially in nickel plating.

The usual method for heating plating baths is either by steam or by electric immersion heaters. Several investigations have shown that heating by electric immersion heaters in many cases will provide maximum economy. This is particularly true where a steam plant must be kept in operation during certain parts of the year to supply heat for this purpose only. In such cases, it has been found economical to have electric heaters available to supplement the steam system. The immersion heaters can be installed in such a manner as to make them readily removable when not in active use.

Several electric heaters adaptable to the economical heating of plating

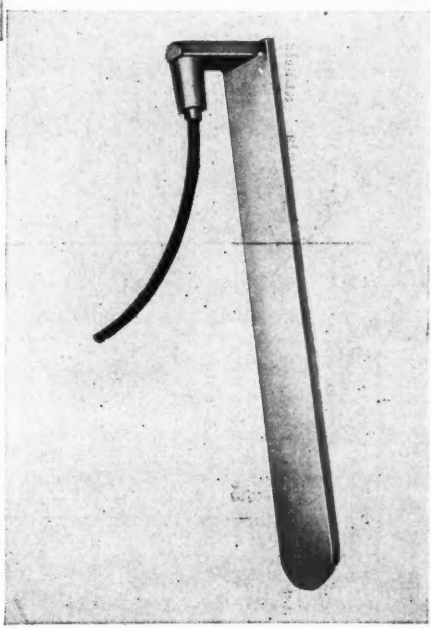

Fig. 3—Cast-in-lead immersion unit heater

Table I

Plate	Solution Components	Common Addition Agents	Approximate Temperature Range	Suggested Sheath Metal for Heating Units	Style of Heater to be Used
Brass	Copper cyanide Zinc cyanide Sodium cyanide Sodium carbonate	Ammonia—caustic soda and arsenic	75-100 deg. F.	Steel	Table II
Bronze	Copper cyanide Zinc cyanide Sodium cyanide Rochelle salts		75-100 deg. F.	Steel	Table II
Cadmium	Cadmium oxide Sodium cyanide	Molasses, glue, and so on	70-100 deg. F.	Steel	Table II
Chromium	Chromic acid Sulphuric acid		95-113 deg. F.	Lead	Table III
Copper (cyanide)	Copper cyanide Sodium cyanide Sodium carbonate	Sodium thiosulphate Lead carbonate in caustic soda	75-100 deg. F.	Steel	Table II
Copper (Rochelle salts, cop. cyanide)	Copper cyanide Sodium cyanide Rochelle salts Sodium carbonate	Sodium hydroxide	125-160 deg. F.	Steel	Table II
Copper (acid)	Copper sulphate Sulphuric acid		75 -85 deg. F.	Lead	Table IV
Gold (cyanide)	Sodium gold cyanide Sodium cyanide Disodium phosphate		140-160 deg. F.	Steel	Table II
Green gold	Sodium gold cyanide Silver cyanide Sodium cyanide Sodium phosphate		122 deg. F.	Steel	Table II
Rose gold	Potassium ferro-cyanide Sodium carbonate Sodium cyanide Sodium gold cyanide		175 deg. F.	Steel	Table II
White gold	Sodium gold cyanide Nickel cyanide Ammonium chloride Sodium cyanide		122 deg. F.	Steel	Table II
Nickel (warm)	Single nickel salts Nickel chloride Boric acid	Nickel carbonate	120-130 deg. F.	Lead	Table IV

Common plating baths and the types of immersion heaters for use with them

baths are the metal-encased immersion heaters of the types shown in Figures 1, 2, and 3. The heater consists of a suitable coiled resistance element embedded in a highly compacted magnesium oxide insulation, all enclosed within a metal tube or sheath. The metal used for this sheath must be of such a nature as to resist the action of the liquid into which it is immersed, and the sheath must have sufficient strength and ductility to withstand the processes to which it is subjected during manufacture and also the requirements of the service for which it is used.

Some materials are suitable for one requirement but not for another. For instance, lead is a very suitable material for resisting the action of some acids used in plating but has little strength. It can be used in immersion units by first making a steel sheath, and subsequently covering this sheath with lead, either by casting the lead around it or by sliding a straight heating element into a close-fitting, heavy-walled tube before forming it into its final shape. In order to prevent the destruction of the units, the terminals of the electric heaters are carefully sealed to prevent any spray or drip of a bath from entering the insulation.

Where the size and shape of the plating bath permit, the most convenient method of installing electric heaters is to hang a unit, such as those shown in Figs. 1, 2, and 3, over the side of the tank in the manner illustrated in Figure 4. This arrangement permits easy inspection and cleaning of the heating unit and also simplifies the removal of the unit from the bath when it is to be out of service for any considerable length of time. An installation of five 5-kw immersion units is shown in Figure 5 located in position in a

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plating bath in the plant of a watch manufacturing company.

The passage of the plating current through the electrolyte always produces a certain amount of heat, the actual amount of which depends on the resistivity of the solution and the amount of current flowing. In some cases, these may be sufficient to maintain proper temperature in the bath, once conditions become stabilized. In baths where this is the case, electric heaters are particularly desirable for bringing the initial solution to the desired temperature. After the bath is in satisfactory operation, the heaters can be removed if removal seems desirable in order to retard sheath corrosion.

Almost all plating solution are more or less corrosive, but among those most corrosive are the common chrome plating solutions. In baths of this type it is particularly desirable to leave the heating units in the electrolyte only when they are in actual service. By following this procedure, the life of the unit can be extended substantially. The operation of the chrome plating bath without proper heating would be poor economy since temperatures substantially in excess of room temperatures are necessary to obtain maximum efficiency and best plating results.

Table II

Watts	No. of Heats	*Volts	See Fig.	Approx. Dimen. in In B	C	E
5000	1	230	6	26	15	3¾
2000	1	230	7	22 3/16	10¾	4¼
4000	1	230	7	33 3/16	22¾	4¼
6000	1	230	7	45 3/16	34¾	4¼

*These are single-heat units. They can be operated in series on 440 volts.

List of immersion heating units suitable for electroplating baths

The higher temperature permits the use of higher current densities; and thus, in turn, improves the cathode efficiency and also increases the hardness and brightness of the chromium deposit. Porosity of the deposit is less at higher temperature because of the greater tendency of hydrogen to escape from a warm

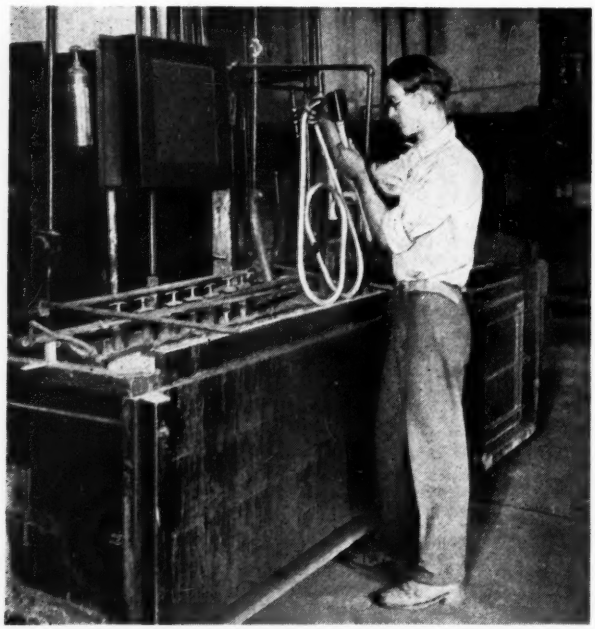


Fig. 4—Illustration showing ease of installation of a portable lead-sheath immersion unit for heating a nickel plating tank

Table III

Watts	*Volts	Approx. Dim. in in. A	C	Active Area Sq. In.	Wt. of Lead in Lb.
2000	230	23	12	172	45
4000	230	34	24	325	68
6000	230	46	36	478	90

*These are single-heat units. They can be operated in series of 440 volts.

List of immersion heaters for chromium plating baths

bath. Table I shows a list of some of the common plating solutions, together with a recommended temperature range. The addition agents given in this table are not the only ones that can be used. However,

Table IV

Watts	*Volts
5000	230

*These are single-heat units. They can be operated in series on 440 volts.

List of immersion heating units for nickel plating baths

if other materials are added the suggested covering metals for the heating units may or may not apply. In any case, it is well to realize that conditions in a plating bath are decidedly complex and that the corrosion rate of heating materials may, therefore, be out of proportion to what may be expected of the same chemicals under different circumstances.

Heating units and the circuit supplying them must be thoroughly insulated from the plating power supply. If provision is not made for this type of insulation, the sheath may be corroded by electrolytic action.

The immersion units listed in Table II, and illustrated in Figs. 6 and 7, are steel-sheath Calrod units and are eminently suited for the following electroplating baths:

Brass	Copper (cyanide)	Green Gold
Bronze	Copper (Rochelle salts, copper cyanide)	Rose Gold
Cadmium	Gold (cyanide)	White Gold

These types of heaters are also suitable for alkaline cleaning tanks.

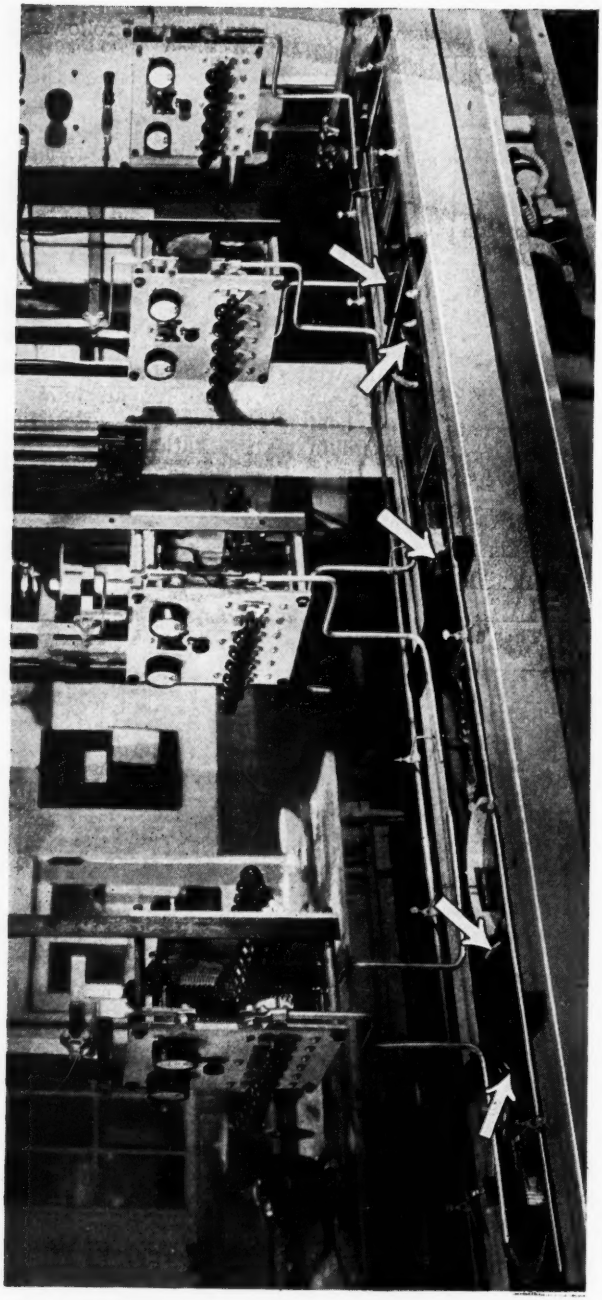
Immersion heaters suitable for chromium plating baths are listed in Table III. These heaters consist of Calrod units cast into lead of a minimum wall thickness of ½ inch. A diagrammatic sketch of an immersion heater of the type used for chromium plating baths is shown in Figure 8.

Table V

Kw Demand (Max.)	No. of Heats	*Volts	Approx. Dimen. in In. Length from End of Unit to Nut on Threaded Collar (Fig. 10)	Diam. of Threaded Collar (Diam. is Standard Pipe Thread of size given)	Overall Length
1.0	3	115	10	1¼	13½
1.0	3	230	10	1¼	13½
1.5	3	115	14	2	18
1.5	3	230	14	2	18
2.0	3	115	18	2	22
2.0	3	230	18	2	22
2.5	3	115	22	2	26
2.5	3	230	22	2	26
3.0	3	115	26	2	30
3.0	3	230	26	2	30
4.0	3	115	36	2	40
4.0	3	230	36	2	40
5.0	3	115	42	2	46
5.0	3	230	42	2	46

*The heaters which are for operation on a 230-volt circuit can be operated single-heat on a 440-volt circuit by running the two elements in series.

List of immersion heating units suitable for sulphuric acid pickling baths



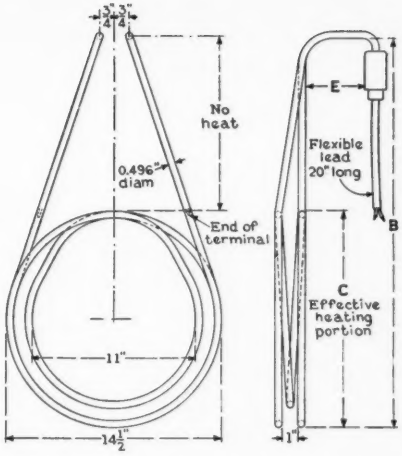
An immersion heating unit for nickel plating baths is listed in Table IV. This type of immersion heater is a Calrod unit enclosed in a lead pipe ¼ inch and formed as shown in Figure 9.

Previous to the application of any coating, the base metal, whatever its nature, should be thoroughly cleaned. This usually involves dipping the metal in an alkaline cleaning solution and subsequent rinsing in a water bath, followed in some cases by immersion in an acid cleaning bath and then another rinsing bath. Immersion units for these baths are listed in Tables II, III, V, and VI.

Immersion heaters for alkaline cleaning baths are available in two types, both having steel sheaths. One type, shown in Figs. 6 and 7 and described in Table II, can be suspended over the side of the tank. The other type, as shown in Fig. 10

Fig. 5—An installation of five 5-kw immersion units in the plant of a watch manufacturing company

Fig. 6—A diagrammatic sketch showing construction of an immersion unit for an electroplating bath.



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and described in Table V, can be inserted through the tank wall. Immersion heating units of the type listed in Table III and illustrated in Fig. 8 are suitable also for sulphuric acid pickling baths, because this type of heater is encased in a thick acid-resisting lead wall.

Water immersion heaters for rinse tanks are listed in Table VI. This type of immersion heater is equipped with a copper sheath and is of the screw-in type similar in appearance to the unit shown in Figure 10.

For calculating the requirements of an immersion heater for an electroplating bath, a plating tank with inside dimensions 3 ft. wide x 8 ft. long, in which the liquid is 3 ft. deep, can be taken as an example. The operating temperature is 130

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Table VI

Kw Demand (Max.)	No. of Heats	*Volts	Approx. Dimen. in In. Length from End of Unit to Nut on Threaded Collar (Fig. 10)	Diam. of Threaded Collar (Diam. is Standard Pipe Thread of size given)	Overall Length
1.2	3	115	8	1¼	11½
1.2	3	230	8	1¼	11½
2.0	3	115	10	1¼	13½
2.0	3	230	10	1¼	13½
3.0	3	115	14	2	18
3.0	3	230	14	2	18
4.0	3	115	18	2	22
4.0	3	230	18	2	22
5.0	3	115	22	2	26
5.0	3	230	22	2	26
7.5	3	230	30	2	34
10.0	3	230	42	2	46

*The heaters which are for operation on a 230-volt circuit can be operated single-heat on a 440-volt circuit by running the two elements in series.

List of immersion heaters for rinsing tanks

degs. F. and the room temperature is 70 degs. F. The tank is equipped with a cover for the heating-up period. Four hours is the time limit to bring the tank to the required heat from room temperature.

The amount of liquid in the tank is 3 x 3 x 8 ft. which is equal to 72 cubic feet. Figure 11 shows that approximately 80 kw-hr are required to raise the temperature of the liquid 60 degrees. Therefore, 80 ÷ 4 = 20 kw-hr per hour, the amount of electricity required to heat the liquid in a four-hour heating-up time. To this figure, heat losses must be added.

Figure 12 shows that the approximate heat losses with the cover on the tank are 110 whr per hour per square foot of top area. The total heat loss at 130 degs. F. with the cover on the tank is therefore 3 x 8 ft. = 24 sq. ft. x 110 = 2.64 kw-hr per hour.

If the tank is now operated without the cover on, the heat loss will be increased, as follows:

Figure 12 shows that the approximate heat losses at 130 deg. F. without cover are 260 whr per square foot of top area. Therefore, 24 sq. ft. x 260 = approximately 6.25 kw-hr per hour heat loss.

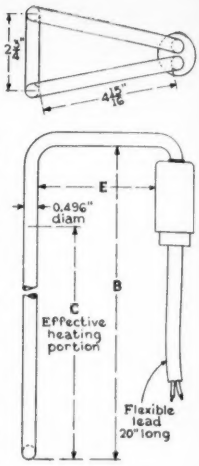

Fig. 7 — A diagrammatic sketch of a steel-sheath Calrod unit immersion heater used in electroplating

In case the metal objects to be plated are transferred from an unheated rinsing tank, they will tend to cool the plating bath and this undesirable effect must be offset by additional heat from the electric immersion units. The amount of the addi-

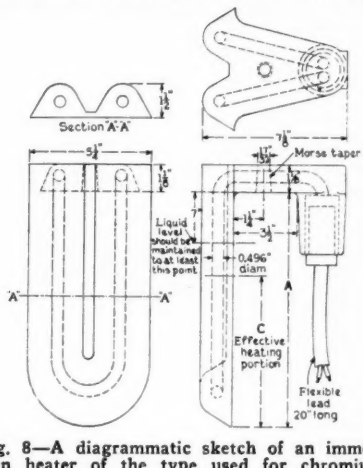

Fig. 8—A diagrammatic sketch of an immersion heater of the type used for chromium plating baths

tional heat required depends on the kind of metal of which the objects are made and on the total weight of metal placed in the bath per hour. Let it be assumed that the objects are of steel and that they are to be plated at the rate of 500 lbs. per hour. From Figure 13 it will be seen that 2.1 whr per pound is needed. The immersion units will thus be called on to supply additional heat equivalent to 500 x 2.1 ÷ 1000 = 1.05 kw-hr per hour.

Since the heating requirements of the tank are represented by a continuous supply of 20 + 2.64 = 22.64 kw during the heating-up period with cover on, and subsequently by 6.25 + 1.05 = 7.30 kw during the plating operation with cover off, immersion heaters having a total rating of 25 kw will be ample for the work.

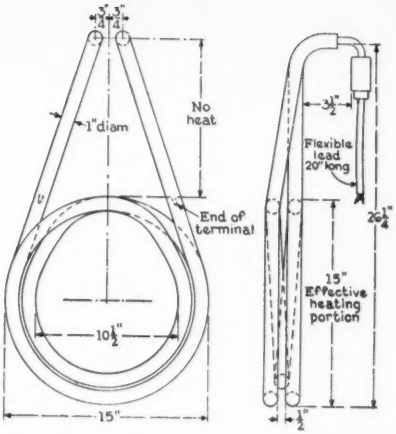

Fig. 9—A diagrammatic sketch of an immersion heater used in nickel plating

If the rinsing tank is operated hot, immersion unit requirements for the

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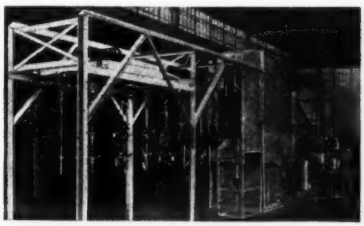

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heating-up period can be calculated for the operating temperature in the same manner as were those for the plating tank. The result will indicate the rating of the heaters necessary for this tank.

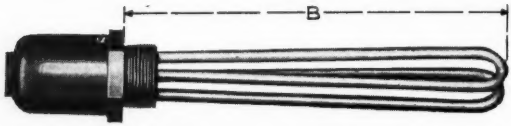

Fig. 10—An immersion heater of the type used for alkaline cleaning baths. This type of heater can be inserted through the wall of a tank

Whether the cleaning of the objects to be plated is done in an alkaline bath alone or in such a bath followed by a cold rinse and an acid or pickling bath, the cleaning solutions are used hot to provide more rapid chemical action.

The heating requirements of each cleaning tank is determined from an analysis of: (a) the heat necessary to bring the bath initially to operating temperature, (b) the heat loss from the tank, and (c) the make-up heat necessitated by introducing in a cold state the metal objects to be cleaned. The procedure is the same as that in the case of a plating tank.

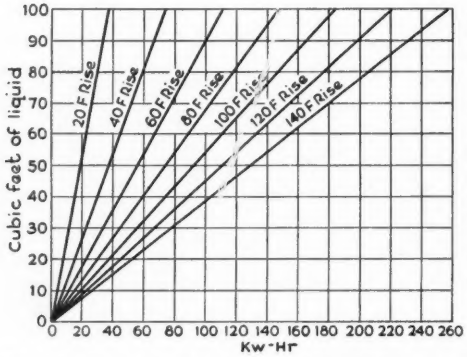

Fig. 11—Curve showing the number of kilowatt-hours required for various temperature rises

As an example, let it be assumed that the cleaning tank is of the same size (3 x 3 x 8 ft.) as the plating tank referred to previously, that the same time (four hours) is permitted for heating the bath to operating temperature, and that the same weight (500 lbs.) of steel objects is treated per hour. Assume, however, that the operating temperature is 210 deg. F. (140 deg. F. rise) for cleaning tanks are run close to the boiling point.

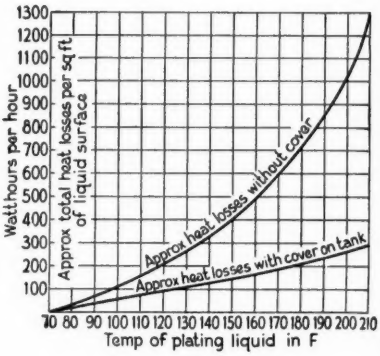
Watt hours per hour
Approx total heat losses per sq ft of liquid surface
Approx heat losses without cover
Approx heat losses with cover on tank
1300 1200 1100 1000 900 800 700 600 500 400 300 200 100
70 80 90 100 110 120 130 140 150 160 170 180 190 200 210
Temp of plating liquid in F

Fig. 12—Approximate heat losses from tanks, per square foot of top area, when tanks and cover are made of wood or have equivalent insulation. Room temperature is assumed to be 70 degrees Fahrenheit

For the 72 cu. ft. of solution, Fig. 11 shows that a temperature rise of 140 deg. F. would require 186 kw-hr or 186 ÷ 4 = 46.5 kw-hr per hour. The additional maximum heat loss with cover on is shown by Fig. 12 to be 200 whr per hour per square foot of top area, or 290 x 3 x 8 ÷ 1,000 = 7kw-hr per hour.

With the bath in use, and without cover on, the heat loss as indicated by Fig. 12 would be

1,300 x 3 x 8 ÷ 1,000 = 31.2 kw-hr per hour.

The make-up heat required by the introduction of 500 lbs. of cold steel objects per hour is shown by Figure 13 to amount to five watt-hour per pound or 5 x 500 ÷ 1000 = 2.5 kw-hr per hour.

Since the heating requirements of this tank are represented by a continuous supply of 46.5 + 7 = 53.5 kw during the heating-up period with cover on, and subsequently by 31.2 + 2.5 = 33.7 kw while in operation with the cover off, a set of immersion heaters having a total rating of 60 kw would be the conservative choice.

If the allowable time to bring the tank to operating temperature were extended to eight hours, with the cover on, the electric energy input would be reduced to (186 ÷ 8) + 7 = 30.3 kw-hr per hour. The later 33.7 kw-hr per hour required during the operating period would then govern the total rating, and in this case heaters having a total rating of 35 to 40 kw should be used.

For the control of the temperature for all types of baths, a thermostat of the type shown in Figure 14 is applicable. The bulb and capillary tubes of thermostats of this type

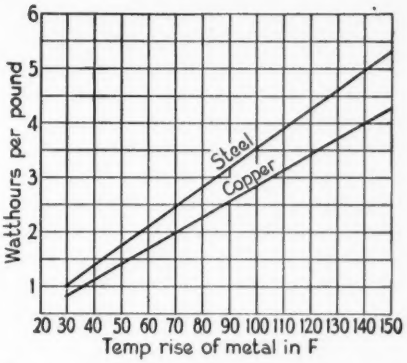

Fig. 13—Curve of watthours required for various temperature rises for steel and copper materials

are made of copper and should be protected from corrosive attack by dead-end tubes of the same material as that used on the heaters for the various types of baths. Thermostats of this type have a capacity of 25 amps. on circuits up to 250 volts, alternating current. For larger current capacities and for circuits of other voltage, these thermostats are used to control magnetic switches.

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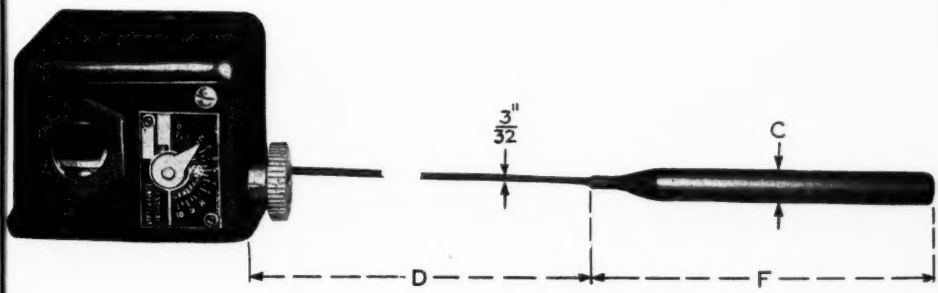

Fig. 14—Illustration showing a thermostat for automatically controlling the temperature of an electroplating bath

BARREL FINISHING OF METAL PRODUCTS

The dry method of finishing light gauge metal products.

By H. Leroy Beaver

FOLLOWING the discussion of the past four months which has had to do with the finishing of plastic materials, and where the parts to be finished were so light in weight that they would or could not respond to any form of treatment with metallic burnishing materials due to the wide variation in the specific gravity of the parts to be finished as contrasted with the materials used, we come now to another phase of barrel finishing where this same problem confronts us.

No one appreciates better than the writer that a barrel finishing operation wherein steel burnishing materials are used has it limitations, and the principal problems effecting its applicability arise in two ways, first, where the weight of the burnishing materials would be such that the light gauge parts sought to be barrel finished would be permanently distorted, and second, where the lightness of the parts to be finished is such that the variation in specific gravity would cause the lighter parts to float on the surface of the heavier burnishing material and where we would have no effective action whatsoever, and this brings us directly to a discussion of the merits of a barrel finishing operation wherein the lighter finishing mediums are sought to be applied, and in much the same manner as they are used in the finishing of plastic materials.

So far as diligent inquiry has determined, the first really serious attempts to develop such a dry method were by Joseph Lupo around 1929, at which time he undertook to finish such articles as salt and pepper shaker tops made of brass and nickel silver, then to some parts of aluminum alloy and later to die cast handles for casement hardware. His first attempts were discouraging and he accomplished no more than was regularly being done in a typical dry method using an oblique tilting type barrel with ordinary commercial sawdust and any one of a number of abrasives, all of which produced a matte finish, the roughness of which was, of course, determined by the grit or grain of the abrasive used in the operation.

If we follow the procedure through, we find that as with many other experimenters as well as actual op-

erators on production work, the assumption was that by mixing sawdust and an abrasive that the rough character of the sawdust would cause the abrasive particles to be held to the surface of the sawdust particles and in this way the flowing action of the mass would tend to reduce the surface and provide a finish. Now, actually, when both sawdust and abrasive are used dry in combination, it will invariably be found that the abrasive is much heavier than the sawdust and for that reason the greater part of it will separate from the wood and will either lie in the bottom of the barrel or will be carried perhaps one-third of the way up the side of the barrel, and then will develop its own characteristic curve of flow motion which will lie underneath the developed flow of the lighter sawdust and this renders the abrasive only very partially effective. For this reason, many of the early experiments were considered as not of much moment because the time required to reduce the surface area of a part was too great, and that faster action could be obtained, provided the parts were sufficiently strong to withstand the pressure, by operating in an iron barrel with abrasives and either water or oil.

It would seem strange that during these experimental years it did not occur to someone that some measures should and must be taken to secure a closer adherence between the abrasive material and the lighter gravity sawdust or wood chip or fiber to make such an operation more effective, but it has only been within the comparatively recent few years that anything along this line has been developed, and then it is a question of whether the development came through attempts to finish plastic materials or metals. Sufficient to note, that first light oils were attempted such as high flash kerosene which, while it was to some extent better than the previous perfectly dry materials, lacked being a suitable medium due to the fact that cleaning after the process was more difficult on account of the use of a mineral oil and secondly, that the oil was too light.

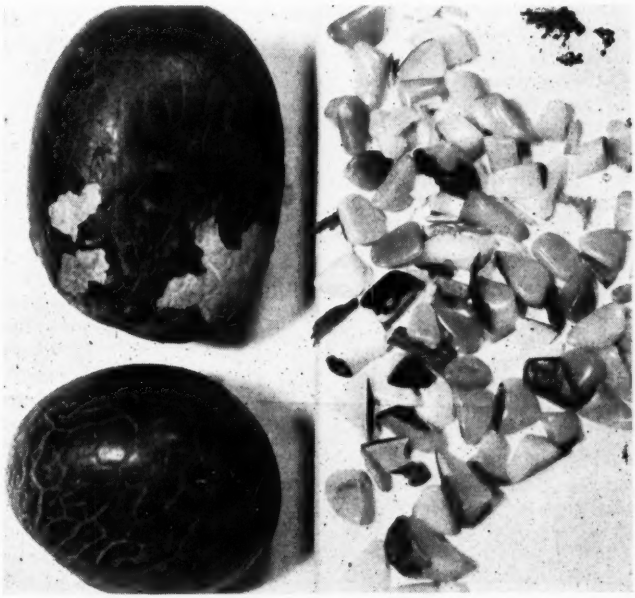

Fig. 1—(Left) Whole Corazo nuts, commonly known as vegetable ivory. (Right) Crushed Corazo nuts that have been processed for use in dry finishing operations.

Following this, various light gravity purely vegetable oils which might be termed as 100 per cent saponifiable were used and this effected a marked improvement, but the extent of the impregnation of the wood by the oil was not certain at any time, and while these vegetable oils were effective when used with one grit and kind of abrasive medium, they were just as often non-effective when another type and grain of abrasive was attempted to be used. Even though these operations are considered as "cold working" of the materials, at the same time sufficient heat was developed in the average running time for a barrel load of work to dry out the slightly impregnated surface and cause a loosening of the abrasive materials.

Perhaps what we might consider as the foremost and most outstanding development in this particular phase of the work was the use of a wax solution. We all understand that in setting up a wheel with glue and abrasive, that the glue must be thinned in proportion to the fineness of the grain of abrasive used. In the use of light oils, the oil film was invariably the same which might and probably does account for its ineffectiveness in many applications where various grits or grains of abrasives were sought to be used.

Just who used wax as a binding medium we are unable to say, but there is no record of it anywhere in any published literature on the subject of metal finishing that we have been able to locate after diligent search. Certainly, we do not claim credit as being the first to use wax as a bonding medium, which we first attempted in 1933. We well recall these first experiments, and the conception of them was like this. We figured that if a softened wax when applied to a pair of shoes might be worked up to a high finish, that here was a medium that might be used due tc its tacky nature, as a binder for holding abrasives against sawdust.

We first took an ordinary tin box of tan shoe polish. Having a very strong odor of turpentine, we assumed that whatever the wax composition might be, that the solvent that was used to reduce it to a paste must be turpentine or some other oil of much the same character. So we removed the polish from the box and kept adding turpentine until we had a solution of about the consistency of ordinary table cream. By pouring this over a load of sawdust in an oblique tilting type of barrel we found that gradually all of the sawdust became coated with a film of wax, that it had a tacky feel when you squeezed a handful of it, and that when we added the abrasive, which in this case was F F pumice, that we not only obtained close adherence of the abrasive to the sawdust, but we found that even after comparatively long runs of materials, that pouring the sawdust onto a fine screen, very little of the abrasive was shaken through the screen which seemed to effectively demonstrate that the wax medium was functioning satisfactorily.

Following this, we took ordinary yellow bees wax which can be purchased from any platers supply house and treated it in the same way, that is, by chipping it into shavings and covering the shavings in an earthenware container with pure gum spirits of turpentine which in a period of twelve to twenty hours will completely take the wax into solution and from this point it was only necessary to reduce the density of the paste to the proper consistency by the addition of turpentine.

When these first experiments were made, it was not with the idea of

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"I find it's a good thing for my younger men to get to the Metal Show for at least a couple of days, too. It gives them a broader vision in their work here at our plant — and makes them more valuable to me, and themselves.

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developing a polishing medium in any sense, but what we were really working toward was some process whereby parts and more especially non-ferrous parts could be cleaned and brightened without the use of acids, and where the so-called acid bright dips might be eliminated. The readers of this series might have sensed long ago that we are not in sympathy with the use of acids in what we choose to term a process for the partial annihilation of the surface of non-ferrous metals. From the operations we have thus far seen by the use of the more modern methods of dry scouring, we do not fear to predict that eventually much of the preliminary cleaning of metal parts will be done in this way and with larger barrels than we have seen up to this time in our average production procedure, the most important factor being, of course, the elimination of the hazards accompanying acid dipping operations.

Now if we will elect to take this early research for a dry scouring method and carry it a bit further we will find that it leads directly into the present-day processes for the finishing of both plastics and the light gauge metals which are not susceptible to finishing with steel burnishing materials.

It is claimed by the present exponents of dry finishing of light gauge metals, that this process effectively closes any pores in the metal surface, whether it be the basis material or the plated surface. To this we cannot in any sense agree for the very simple reason that we have found in barrel operations following plating that even using loads of steel burnishing materials aggregating over 200 pounds that we cannot effectively alter the degree of plasticity of the plated surface to cause the closing of pores to resist corrosion and wear and that we have never felt sure that this operation would be successful completely when loads of under 600 pounds were used. When we consider that the average load of material and wood finishing medium as operated in the average dry burnishing barrel will seldom gross more than 75 pounds, we can easily see the mechanical impossibility of substantiating this claim.

The first operation in the dry finishing of light gauge metal products is scouring. This is accomplished by the use of either coarse maple sawdust or fine wood chips somewhat resembling the chips coming from a planer which have been impregnated with either a soluble oil or wax solution to which the abrasive has been added. In this operation either a very fine pumice, silica flour, whiting, diatomaceous earth or talc is used as the scouring medium and the finish obtained is roughly equivalent to that which we might obtain by using a set-up wheel and abrasive grading from 180 to 200. The finishing cycle is generally conducted in three and sometimes four operations somewhat as follows:

1. The operation immediately heretofore described.
2. Also wood chips or sawdust properly treated with binder medium, using about 20 per cent of the total bulk of the burnishing mass as abrasive.
3. Using the same base materials as the above but with soft polishing abrasives to about 35 per cent of the total bulk of the mass.
4. Using the same wood bases properly impregnated and with up to 60 per cent of friable abrasive material to produce the equivalent of a "crocus" finish.

When the range of materials as above described are used we attain an operating cycle approximately as follows:

1st operation	...12	to	16 hours
2nd operation	... 4	to	7 hours
3rd operation	... 4	to	7 hours
4th or Coloring	.. 1	to	3 hours

which gives us an actual operating time period of from 21 to 33 hours for the production of a satisfactory marketable finish on light gauge metal products.

There is another medium used to some extent as an auxiliary in the dry finishing of light gauge metal parts and this is the crushed ivory or Corazo nut composition. We have had quite a number of letters since the start of the discussion of dry finishing asking us to explain what is "vegetable ivory," where does it come from and of what is it composed. The commercial vegetable ivory most commonly used in this country for buttons and other small ornamental turnings is the seed of a tropical palm tree. The heads or fruits are known as Corazo nuts and grow generally about the size of a man's head and each tree may bear from six to eight of these "heads." The dried seeds of the ripened fruit constitute the "vegetable ivory" of today, and the trees are cultivated and found mostly in Bolivia. In turning down these nuts into buttons and other small articles, the rings that are the residue of the turning operation, as well as imperfect nuts that cannot be processed, are crushed and

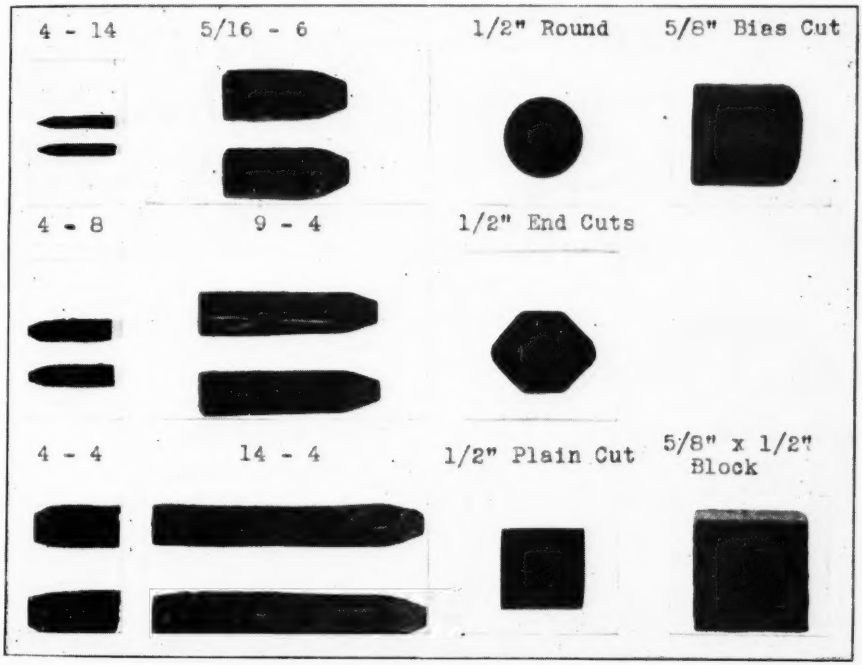
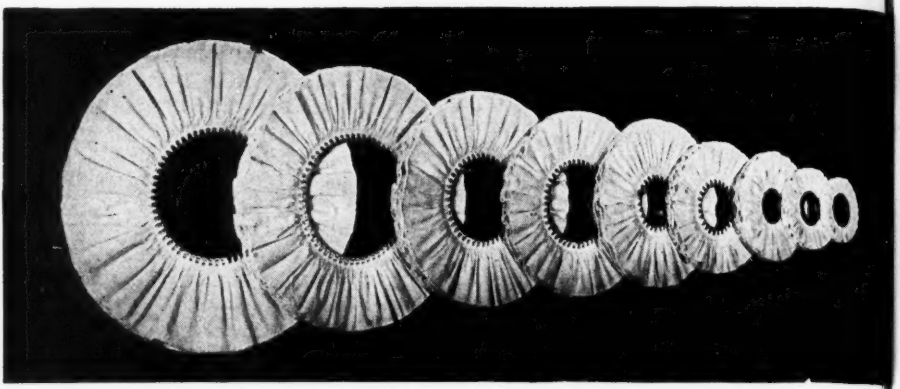


Fig. 2—Illustration of wood finishing materials showing a number of the most widely used shapes and sizes.

AIRWAY *Ventilated* BUFFS



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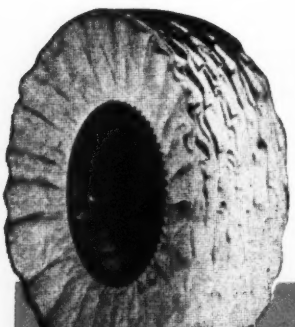
2. Faster cutting and does not ridge the work.
3. Eliminates burning.
4. Raveling eliminated, requires no raking.
5. Saves compound.

Made in all grades of cloth. Only bias material used. Available diameters 5" to 18".



Use half as many sections.
Wears twice as long.
Costs half as much.

JACKSON BUFF
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AIRWAY *Ventilated* BUFFS

VENTILATION

The AIRWAY BUFF is used with metal center plates and flanges so arranged as to allow the centrifugal action of the buff to draw air in at the sides of the wheel and pump it out radially between the buff sections. This circulation of air through the AIRWAY keeps it cool under most severe operating conditions, entirely eliminates burning and thus prolongs the life of the buff. This permits 50% to 100% higher speeds.

COMPOUND SAVING

The bias construction of the AIRWAY eliminates ravel and wasting of buff as well as compound.

The ventilating feature keeps the buff cool and reduces the tendency of the compound to melt and be thrown off.

The AIRWAY should not use more than 50% of the compound used with a conventional buff.

OTHER ADVANTAGES

The AIRWAY requires no raking, has a very fast cut and does not ridge the work. It is clean because there are no cross threads to pull out and the composition stays on the buff.

It has a wide face and usually two sections are equivalent to four of the conventional buffs. This should be considered when comparing prices with conventional buffs.

WARNING NOTICE

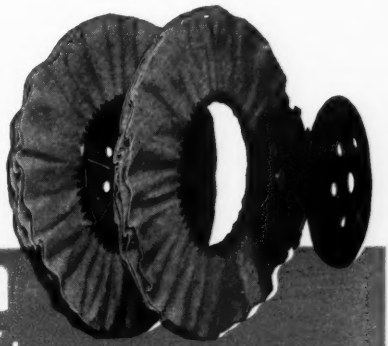
Jackson Buff Corporation of Long Island City, New York, has rights to U. S. Patents Nos. Re 19,894 and 2,140,208 which have broad claims covering an air-cooled buff having means for the admission of air through the sides of the buff. Owner intends to protect these rights and to stop infringement.

MATERIAL USED

Special sheeting used for cutting or coloring as your requirements demand. All bias cut, no ravel, no waste, no dirt.

Center plates and flanges made to suit the customer's spindle diameters.

Write us direct for samples or get in touch with a Licensed Jobber or Distributor.



CORPORATION

LONG ISLAND CITY, N.Y.

then sized, the most popular size being those particles that will screen out to roughly 3/16 in. in size, but ¼ in. and 5/16 in. screen are also used to a considerable extent. When these vegetable ivory mediums are used, they are generally operated with abrasives in a preliminary way to treat them by removing the sharp cutting edges. In some cases, they are lightly waxed when used with abrasive materials while in other operations the polished crushed nut portions are used alone, simply as a pressure polishing medium. Illustration Figure 1 shows both the whole and also the crushed and processed Corazo nut.

In addition to the treated sawdust used in the operations as heretofore described, it should be understood that the sawdust or chip base is simply the carrier for the abrasive or polishing materials used in the process. When used alone, these would not be especially effective, and so in the polishing of plastics, as well as light gauge metals, wood forms are used to roughly approximate the action that would be obtained in a conventional type of burnishing barrel where steel burnishing materials are used. In order that the reader might form a better opinion of the character of these wood finishing materials, we illustrate a number of the most widely used shapes and sizes in Figure 2. While all of the long forms are known as "shoe pegs," it will be seen that in only one instance, the smallest size, do the parts resemble the shoe peg of commerce as it is generally understood. These sizes are known commercially as 4-14; 4-8; 5/16-6; 9-4; and 14-4 which constitutes the range of peg sizes. These are produced in this size range for the reason that many parts, both in plastics as well as light gauge metals, have either holes, angles or grooves where either the one size of peg would not go or else might stick and be difficult to remove. Of the other wood products generally used, they are known as ½ in. round; ½ in. end cut; ½ in. plain cut; ⅝ in. bias cut and ⅝ x ½ in. block. All of these parts are

FERRO

Ferro Booth at N. Y. World's Fair

This entire exhibit is built of porcelain enamel. This includes Veos tile, covering the 19 ft. high front pillars, wainscoting, light canopies, 24 ft. high pylons at either side of the large mural, company signs, and so on. The mural depicts the "Porcelain Enamel City of Tomorrow" and was designed and executed by Daniel Boza, Cleveland, Ohio, mural painter.

made from hard maple.

We have a reasonable supply of all of these formed wood materials such as we use in our own research work on hand, and if any of the readers of this series would care to have samples, we will be glad to send them if the request is addressed to PRODUCTS FINISHING. There will be no obligation, of course.

Now as to the wax solutions and other mediums commonly used in what we term the "dry finishing" process, there are about six of these compounds available at the present time, and mostly from two manufacturers. They are rather difficult to describe but are roughly divided into two classes, one series being heated to the proper consistency before being applied to the finishing material and the other class being used cold. To enter into a comprehensive discussion of the application and use of all of these compounds would require entirely too great a space than is alloted in this series, but if manufacturers of any materials either from plastics or light gauge metals will submit samples, we can then advise them direct which of the compounds would be best for the work as well as which of the carrier and polishing mediums would function most effectively.

Generally speaking, on all cases of the finishing of metal parts we can obtain uniformly better results and in less time with steel burnishing materials operated in a proper size and type of barrel for the work, than can be obtained by the dry method, and in the use of steel burnishing materials we do actually close the porous areas in the plate to provide for greater resistance to both corrosion and wear, substantially as outlined in the March, 1939, issue of PRODUCTS FINISHING. In either case, commercially marketable finishes can be easily obtained, but in the dry process where we have cupped parts such as might be illustrated by vanity case forms and such parts, we cannot build up sufficient pressure to effectively finish the inner surfaces, and in hand buffing and coloring operations, the process being an inanimate one, much of the finer touches of the hand operator such as "feathering off," of course, cannot be obtained.

In this connection, we have had several requests as to whether finishes equivalent to those obtained by the use of the Lea Method could be also obtained by the use of this dry finishing process. So far as it has been developed, we would say no to these questions. The Lea Method is a highly developed one and involves the personal element as we might term it and is not mass production as this term is generally understood. It is quite possible that preliminary operations might be done by the dry method of barrel finishing, which might save perhaps one of the Lea operations, but we know of no barrel method that will duplicate the fine matte finishes that are obtained by the use of Lea Greaseless Compounds.

(Note—Illustration Fig. 2 was supplied through the courtesy of Rudolph Seibert, Rochester, N. Y.)

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ELECTROPLATING ON ALUMINUM

By RAYMOND YATES
Vice-President, Krome-Alume, Inc., Lockport, N. Y.

DURING the past twenty years, since aluminum has become a commercially important metal, many attempts to electroplate it have been made and a number of patents have been issued to erstwhile inventors who had hoped to overcome the difficulties imposed by a strongly electropositive metal that was at the same time extremely susceptible to oxidation at normal temperatures. Ordinary atmospheric oxygen is quite capable of producing an extremely thin film of aluminum oxide by normal contact and without elevated temperature. While the surface of aluminum oxide produced by contact with ordinary atmospheric oxygen could be easily removed by a number of solvents, it would instantly reform upon contact with the atmosphere or even upon contact with solutions containing an appreciable amount of dissolved oxygen. This, combined with the fact that the aluminum is strongly electropositive, imposed almost insurmountable difficulties upon those who attempted to plate it.

A few of the inventors who had dedicated themselves to chasing this electrochemical rainbow did achieve plating of a sort, but it was quite incapabale of withstanding ordinary commercial abuse. Any adhesion that was established came about as a result of mechanical rather than an electrochemical plating method. One inventor achieved some success by etching the surface of the aluminum heavily in a series of corrosive dips. Obviously, it was his intention to so treat the surface of the aluminum that the nickel plating would be keyed into the interstices formed by the corrosive action of the acid on the metal. The process had some use for a time, but it gradually came to be recognized that this form of plating failed to meet standard specifications as they related to adhesion and subsequent treatment by way of buffing. It will be rather clear even to those inexperienced with plating methods that a buffed surface can be no better than the underlying surface and if plating is achieved by heavy etching, consequent buffing operations will be found very disappointing indeed. In short, with an etched surface it is practically impossible to obtain a high luster on the surface of the metal so treated.

In every instance where aluminum was plated without preliminary treatment of etching, the results were very sad indeed and no record has ever been made of commercially acceptable adhesion being produced in any instance. Until about two years ago it was generally conceded that there was no acceptable method of plating aluminum in the sense that other metals are plated.

During the year 1934, Mr. William J. Travers, a Buffalo electrochemist,

Fig. 1—Die cast aluminum parts of vacuum cleaners, household appliances, automobile accessories, and so on can be plated with a permanent coating of nickel and chromium which is both beautiful and durable.

•

was granted a patent for plating aluminum that approached the problem in a manner not employed heretofore. The patent covered a process that is now being introduced successfully on a wide commercial scale and which provides a form of maximum adhesion that is found in many cases to be superior to plating on zinc and certain grades of steel. On most of the aluminum alloys, expert electrochemists have agreed that the adhesion is 100 per cent and that this form of plating can now take its place without apologies beside plating on the more commonly used metals. As an instance of the excellent adhesion established, it may be stated that plated sheets of 2-S and 3-S metals may be bent and formed by punching and pressing methods without in the least showing any tendency to flake or peel. One of the large producers of preplated metal sheeting is now engaged in the production of plated aluminum sheet which is being supplied to manufacturers of stamped articles. Such plated sheet material may be bent a sufficiently large number of times to rupture the sheet without in the least disturbing the plating thereon.

Whereas other inventors have fought desperately to remove the last trace of aluminum oxide from the surface of the metal before plating, William Travers adopted the perfectly paradoxical method of increasing this coat of oxide before instituting the plating process. This sounds neither reasonable nor logical and yet through this process the most successful method of plating aluminum to date has been devised and proven to be perfectly acceptable to some of the largest manufacturers and job plating plants in the United States.

Instead of relying on the atmosphere or ordinary chemical dips for the production of his oxide coat on the surface of aluminum, Mr. Travers created a film at a very rapid rate by the employment of the anodic process. This calls for making the aluminum the anode in an electrolytic bath containing oxalic acid. Upon the passage of current, oxygen is evolved at the anode and there proceeds to combine with the aluminum and build up a comparatively thick film of oxide on the surface of the metal. The thickness of the oxide film may run as high as one thousandths of an inch under suitable conditions.

The film has a composition which corresponds roughly to the aluminum

Fig. 2—Illustration showing a setup of equipment for plating aluminum die-cast parts.

oxide used in an Aloxite grinding wheel. The film cannot be removed with ordinary contact on a buffing wheel and yet, even though it resists this action, it is very pliable and can be bent and formed without rupture. A film so formed is also highly resistant to heat and all ordinary mechanical abuse. However, if such a film is placed over a piece of aluminum and the aluminum is in turn placed in a nickel plating bath, it would be found that the cathode efficiency would be zero and that no nickel would be deposited. This is due to the fact that the aluminum oxide film or anodic coat, as it is sometimes called, is an exceptionally poor conductor of electricity and, being so poor, it is classified as a dieletric.

The Travers Krome-Alume Process is only initiated by the establishment of an anodic coat. Aluminum articles so treated are subsequently exposed to the action of a chemical in what is called an anodic modification bath, which for some reason still not understood renders the anodic coat conductive so that when aluminum articles with anodic films are placed in nickel plating solutions, a deposition of nickel will take place.

Although it is not definitely known just what transpires in the nickel plating bath, it is commonly believed that the nickel ion works its way down into the interstices or pores of the anodic film and so anchors itself. Although the pores in the anodic film are sub-microscopic and consequently have never been observed, it is known that such anodic films readily absorb certain dyes and therefore can be colored.

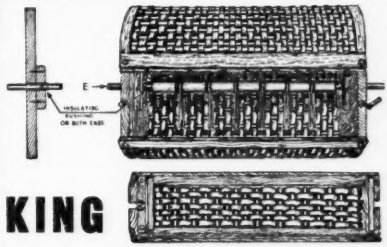
After aluminum articles which are to be plated have been anodized, rinsed, and subjected to treatment

in the anodic modification bath, they are again rinsed and are ready for nickel plating. The time required between the anodic bath and the nickel plating tank usually runs about twelve minutes. It is important to make a distinction between a method of plating aluminum and a method of preparing aluminum in such a way that it may be plated in all of the common types of nickel baths. Aluminum prepared by the Travers Krome-Alume Process is immediately available for plating in either bright or gray nickel and in either hot or cold solutions without in any way exposing these solutions to contamination as would be the case in event raw aluminum were placed in such tanks. From this it will be seen that aluminum from a plating standpoint at last takes its position beside all of the common metals.

Through the means supplied by the Travers Krome-Alume Process aluminum becomes available for plating with copper, gold, silver, cadmium, bronze, or any one of the metals commonly used for deposition. Practice dictates, however, that it is most advisable to interpose an underlying layer of nickel between the aluminum and any other metal that is to be deposited over the outer surface. Chromium may be deposited direct, but this is not an advisable procedure and all commercial plating is now being done by the Krome-Alume Process making use of the nickel undercoating.

It is natural that the Krome-Alume Process has opened up many new uses for aluminum and has placed the metal in a position where it becomes available for employment in situations that have heretofore been impossible. The process lends itself beautifully to ordinary decoration, inasmuch as the metal is not etched before processing and is therefore quite capable of taking on high lustre. The process is free from the necessity of etching so that only the mildest cleaners of the metal are recommended for use.

Commercial development of the process has opened the way to a number of special applications quite apart from those in the purely decorative field. Although much work has been done in connection with aluminum solders, no satisfactory method has as yet been proposed for the combining of aluminum with other metals through the application of either high-or-low-melting point alloys. However, after aluminum has been plated with a thin film of nickel which may be only 0.0002 in. thick it becomes available for soldering by the use of ordinary materials. With the form of adhesion established between nickel and aluminum through the use of the Travers Krome-Alume



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Process, a subsequent soldering of the surface produces good results. In every instance, the solder will rupture without showing any tendency to remove the nickel plating. This feature has made the process available for the fabrication of small aluminum articles and for certain applications in the electrical industry where low resistance contacts with aluminum must be supplied through the medium of a fusible alloy.

In the past, many attempts have been made to make aluminum available for use in machine parts where it is called upon to resist wearing action. Such methods have not in any sense been acceptable and it has been only during the past few years and through the use of the Travers Krome-Alume Process that advancements in this field have been made. A heavy chrome plating over nickel base has been found to provide aluminum with an excellent wearing surface that has been sufficient to resist wear in aluminum automobile pistons for an indefinite period. Contrary to what might be ordinarily thought of as a sufficient coat of chromium, it has been found that a deposit of even 0.0002 in. of this very hard metal is sufficient to bring about an increase in the wearing properties of aluminum and aluminum alloy parts.

Perhaps many of the readers of PRODUCTS FINISHING are interested in a noteworthy application of the process in the foundry field. During the past few years there has been a distinct tendency toward the use of aluminum patterns. Inasmuch as most of these patterns are produced by the sand casting method, they have been incapable of long resistance to the abrasive actions involved in repeated withdrawals. In some instances, fifteen or twenty thousand impressions have been sufficient to reduce the size of the aluminum pattern to a degree that seriously violates any tolerances that have been established. Plating such patterns with nickel and chromium has been found to increase life to an indefinite period. Such patterns, now in use in life tests, have exceeded the period where any doubt concerning their economical use could have been held. Sufficient time has not yet elapsed to make a scientific appraisal of their usefulness, although it has been definitely established that the cost of plating them is indeed trivial compared with increased life. An added advantage of the use of plated patterns has to do with the ease which they may be withdrawn which is logical in the case of a highly polished article that tends to hold its surface.

The Travers Krome-Alume Process becomes available for the plating of aluminum in any one of its useable forms, that is, sheet material, die castings, sand castings, wrought or extruded metal. The only variation involved in the treatment of the various forms and alloys has to do with the time element in the process. Each alloy for different materials requires specific time and treatment.

The equipment necessary for the preparation of aluminum is moderate and depends upon the volume of material to be plated. In place of using expensive direct current generators for the establishment of the anodic coat, the process employs alternating current which is supplied through the medium of a properly wound transformer, the secondary of which is equipped with multi-voltage taps. Current flows from the transformer to the anodic treatment tanks which may be of the ordinary boiler plate variety lined with rubber. Only two tanks are required, one for the anodic treatment and one for the anodic

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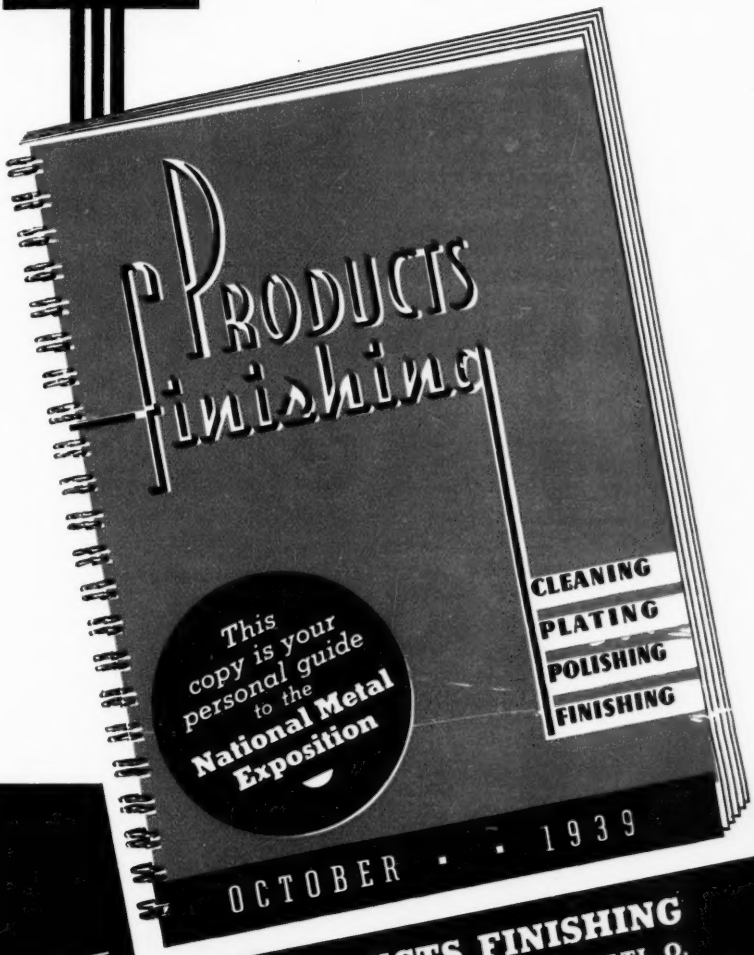

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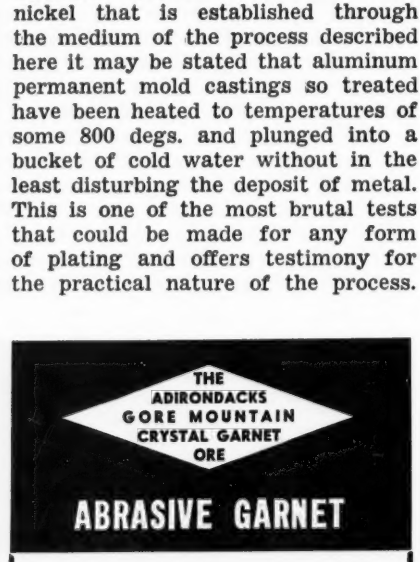
431 MAIN STREET, CINCINNATI, O.

modification treatment, the latter being a plain boiler plate tank with double-welded seams. It is estimated that a 15 K.W. installation which is sufficient for sizable commercial production may be installed. Installations now in use throughout the United States run all the way from 5 K.W. to 60 K.W., and even larger installations are being planned.

As an example of the excellent adhesion between aluminum and nickel that is established through the medium of the process described here it may be stated that aluminum permanent mold castings so treated have been heated to temperatures of some 800 degs. and plunged into a bucket of cold water without in the least disturbing the deposit of metal. This is one of the most brutal tests that could be made for any form of plating and offers testimony for the practical nature of the process.



Sole plates of aluminum used on flat irons have been employed for months on end in commercial laundries without showing wear. The sponsors of the Travers Krome-Alume Process claim that repeated heating of nickel plated articles tends to increase rather than to decrease the adhesion established. Continuous heating tends to alloy the nickel and the aluminum and rather than a form of abuse it turns out to be an excellent method of furthering a still greater bond.

Oakite Brochure. An interesting 48-page illustrated brochure, attractively bound, portraying the important part that production cleaning and its related operations play in America's leading industries has just been issued by Oakite Products, Inc., 20 Thames St., New York, N. Y., in connection with its 30th Year Anniversary.

Among the 40 different industries featured are included steel, automobile, mechanical, aviation, machine tool, stamping, plating, air-conditioning, ceramic, and porcelain enameling. It is said this is the first time that the story describing the scope and influence of industrial cleaning in industry has been published in so complete a form. The text matter is concise and contains much statistical and historical data bearing on the contributions made by American industry to the nation's economic progress.

Copy free upon request.

Spraco Portable Fire-Fog Equipment. Spraco "Fire-Fog" Equipment for extinguishing oil and other flammable liquid fires consists of a variety of nozzles and play pipes. This equipment is manufactured and marketed by Spray Engineering Company, 120 Central St., Somerville, Mass., and is described in this bulletin.

The design of the Spraco Fire-Fog Nozzle is such that the larger portion of the water passes through the outer vanes of a stationary turbine center, setting up a rapid, swirling motion. The remainder of the water passes through a center jet, striking an outer rotating mass at the proper point within a mixing chamber. This causes the water to issue from an orifice in a full-bodied,

finely divided, conical formation of uniform density across its sectional area.

The Spraco Fire-Fog Nozzles illustrated in this bulletin are furnished in five sizes with capacities at different pressures as listed in a specification table.

Nozzles with pipe sizes 1½ in. and 2 in. are furnished in conjunction with specially designed play pipes in order to make possible their proper manipulation when operating from a hose line.

Illustrations showing the Spraco patented Fire-Fog Play Pipes designed for direct connection to standard fire hose couplings are shown. A copy of "Spraco Portable Fire-Fog Equipment" will be sent free upon request.

Portable Electric Tools. The Van Dorn Electric Tool Company, 720 Joppa Rd., Towson, Md., now has ready for distribution its 1939 catalog of portable electric tools and accessories. The catalog covers the entire Van Dorn line of 114 different portable electric tools such as drills, tool chests, drill stands, hole saws, screw drivers, nut runners, tappers, saws, hammers, Lectro-Shears, bench grinders, portable grinders, heat guns, glue pots, sanders, surfacers, polishers, vacuum cleaners, valve seat grinders, valve lappers, valve shops, and valve refacers, as well as attachments and accessories.

Many new refinements in design and construction may be noted, as well as several entirely new items. Copy free upon request.

Suporcel Porcelain Metals Modernizes. Information regarding the method whereby Suporcel Porcelain Metals has given stores, buildings, and homes of America an entirely new and up-to-the-minute appearance is described in this bulletin now being issued by Porcelain Metals, Inc., 28-26 Borden Ave., Long Island City, N. Y. This bulletin describes how Suporcel Porcelain Metals are being supplied for artistic outdoor murals, vending machines, special novelties, and so on.

This beautifully illustrated bulletin will be sent free upon request.

Metallizing Booklet. Metallizing Company of America, Inc., 1351 E. 17th St., P. O. Box 822, Arcade Station, Los Angeles, Calif., is now issuing a 26-page booklet giving complete details on metal spraying, with new pictures and applications, listing equipment necessary for such work. In addition, there is information regarding the Propane-Mogul metallizing gun. A copy will be sent free upon request.

Progress in the Air. A four-page folder entitled "Progress in the Air" is now being issued by American Blower Corp., 6000 Russell St., Detroit, Mich. Many of the standard lines of heating, ventilating, cooling, air conditioning, and air handling equipment are shown in this folder.

The complete facilities of a new plant in Detroit are available to those who are contemplating building special equipment such as vessels, tanks, or other apparatus that involves heavy plate work, welding or the use of special metals.

A copy of "Progress in the Air" will be sent free upon request.

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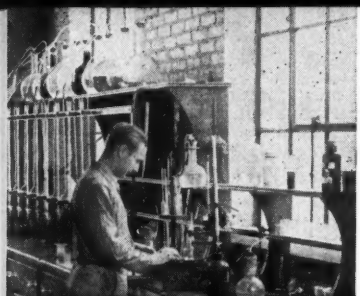
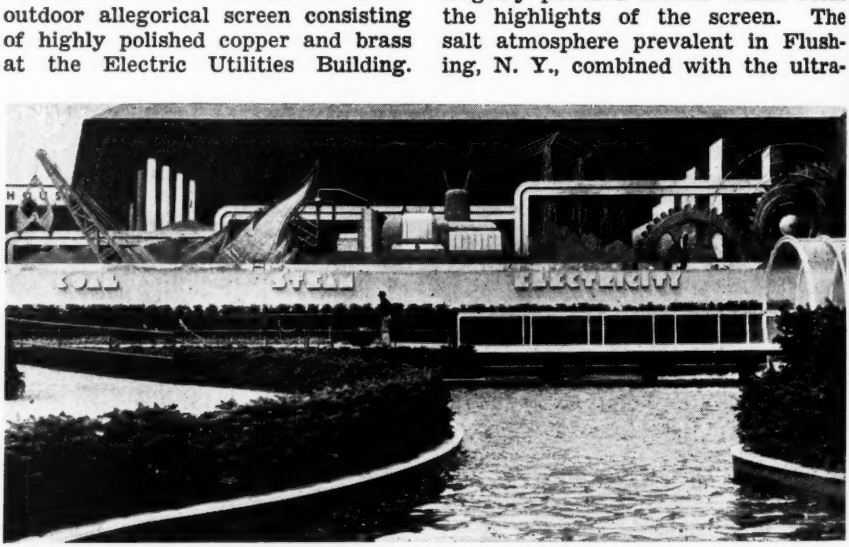


the FINISHING forum

Protection for Polished Metals Afforded by New Materials in Use at N. Y. World's Fair

ONE of the outstanding exhibits at the New York World's Fair is the outdoor allegorical screen consisting of highly polished copper and brass at the Electric Utilities Building. This screen, sponsored by the Copper & Brass Industry Exhibit, is 185 ft. long and 30 ft. high and depicts the evolution of power from coal to electricity.

The important problem in this exhibit is the maintenance of the original lustre and color tones of the brightly polished metals which form the highlights of the screen. The salt atmosphere prevalent in Flushing, N. Y., combined with the ultra-



Allegorical Screen at Electrical Utilities Exhibit at the N. Y. World's Fair

violet rays from the sun, accelerates oxidation of any metal surface. Protection against this is obtained by the use of a new transparent metal lacquer known as "Seal-Cote," manufactured by The Fales Chemical Company, 545 Fifth Ave., New York, N. Y. This lacquer is formulated from recently developed synthetic materials and provides the necessary durability and resistance to the elements, at the same time having sufficient flexibility to withstand contraction, expansion, and bending of the metal surface to which it is applied.

Interests of Workers Chief Reasons Given by Management for Installing Dust Control

"WHY did you install dust collectors?" was one of the questions asked recently by a sales manager* of a large manufacturer of dust control systems, blast cleaning and finishing equipment, tumbling mills, and so on in a letter written to some prominent and nationally known firms in various industries.

While many good reasons were given, it is noteworthy that back of of them in general was the desire of the management to provide healthful working conditions as expressed in the following excerpts from typical replies.

" . . . dust nuisance was the first consideration in making these installations and we are very well satisfied with the result."

"We might say that it would be very difficult to estimate the economic returns of our dust collecting installations. These returns are intangible, although we do feel that they are there."

"Our decision to install collectors at our various plants was brought about more by the desire to clean up the plants and improve conditions in general, and I might say that wherever we have made installations we have accomplished all that we set out to do. All our plant superintendents are very well satisfied with their installations and, as you know, we are again installing a number of collectors this winter which should be pretty good evidence that we thoroughly believe in them. General cleanliness around the plant and goodwill from the employees is, of course, an economic advantage, but it is hard to measure in dollars and cents. Only in one case were we requested by the authorities to install a collector—all the other installations are being made on our own initiative."

"We have recognized the value of dust control from the standpoint of housekeeping and better relations with the workers employed in these departments. We have found that, when the workers recognize the desire of the management to provide

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Through the cooperation of outstanding authorities in the fields of metal cleaning, plating, burnishing, lacquering, and so on, PRODUCTS FINISHING is prepared to aid you in the solution of your finishing problem. There is no charge for this service.

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them with clean, healthy working areas, they immediately show a greater interest in their work, and in maintaining the premises clean and the equipment in working order."

* Fred A. Ebeling, Sales Manager, The W. W. Sly Manufacturing Co., 4700 Train Ave., Cleveland, Ohio.

Humidity As a Factor in the Strength of Enamels

By D. G. Moore and W. N. Harrison

VITREOUS (porcelain) enamels are harder to break in dry weather than in damp weather, according to the results of a study recently completed at the National Bureau of Standards. Twenty-gage angle irons, 8 in. long, made by bending 8 in. x 2 in. strips of enameling-grade sheet iron, were enameled and tested by twisting until the enamel chipped at the apex. The angle of twist required to cause failure was taken as the index of resistance to chipping in torsion. For an enamel thickness of 0.015 in., a decrease in relative humidity from 98 per cent to 35 per cent caused a 15 per cent increase in the angle of twist required to produce chipping. The temperature during all tests was constant. Several test specimens that were given a thin coating of paraffin before they had completely cooled after firing were tested at 98 per cent relative humidity and withstood nearly a 30 per cent greater angle of twist without failure than uncoated specimens tested under the same conditions.

In addition to the tests on enameled iron specimens, moduli of rupture were determined in three series of tests on fibers of enamel frit about ¾ mm. (1/32-in.) thick, drawn from the molten material. In the first series, a sustained-load test was used

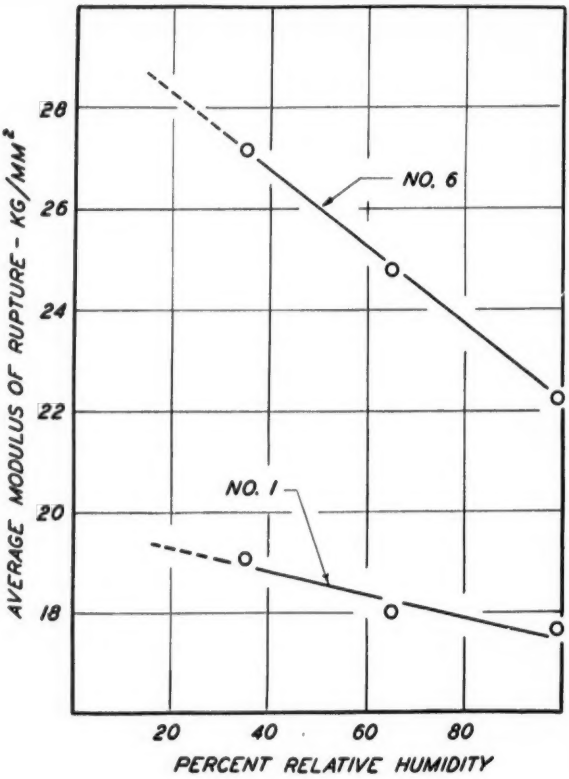


Fig. 1—Graph showing that the modulus of rupture of fibers of enamel frit was greater at low relative humidity than at high. This data was obtained in the increasing-load test. Frit No. 1 is a "soft" sheet-iron ground coat, and frit No. 6 is an acid-resisting cover coat.

in which twenty specimens were loaded at the same stress and allowed to stand under constant load for twenty hours, unless failure occurred sooner. The percentage of specimens which failed within this period was noted and the same procedure was repeated at a higher stress. Greater stresses gave greater percentages of failure, and the stress required to produce failure in 10 out of 20 specimens was determined as the end point. One hundred or more specimens were required for such a determination. In the second series, an increasing-load test was used in which a transverse load was applied at constant rate until failure occurred. This procedure was repeated until enough specimens had been tested to give a statistically stable result. About 50 specimens were used for each determination. The third series was similar to the second, except that the specimens were immersed in various liquids during tests.

In a period of relatively high atmospheric humidity, one of the frits under sustained loading showed a failure of 10 specimens out of 20 at a stress of 9 kg/mm². Later under the same conditions, except for lower humidity, this frit showed a failure of only three out of 20 specimens during the 20-hour sustained-load test. However, when a small drop of water was placed gently on the midpoint of each specimen, the remaining test fibers began breaking almost immediately and 10 additional ones had broken within 40 minutes, raising the percentage failure from 15 to 65. Calculations indicated that the weight of the drops of water

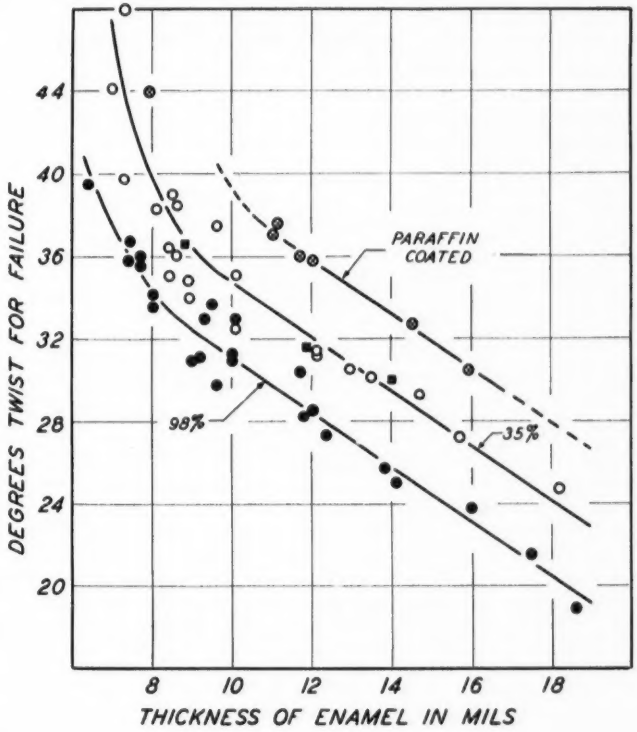


Fig. 2—Angle of twist required to cause chipping of enameled-iron specimens, plotted against thickness of enamel. The two lower curves are for tests made at 98 per cent and 35 per cent relative humidity, respectively, on untreated specimens. The upper curve is for specimens given a moisture-repellent coating of paraffin before completely cooling after firing. All tests were made at 21 deg. C. (70 deg. F.) on specimens coated with an acid-resisting enamel. Each point represents a different specimen.

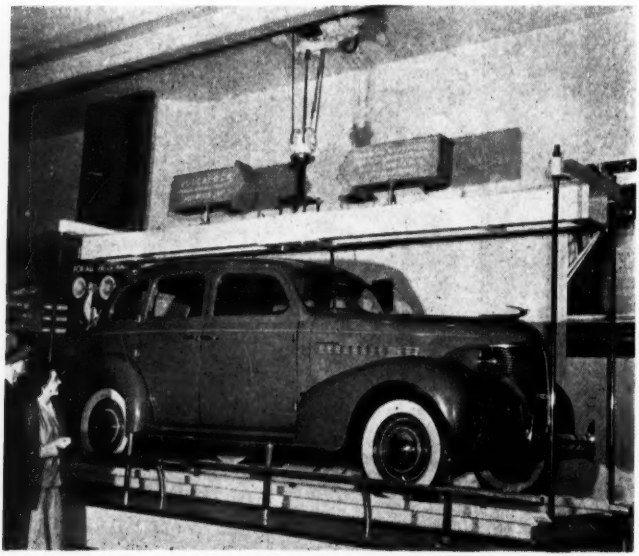
could not have increased the maximum fiber stress by more than 0.03 kg/mm².

For further study of the effect of humidity upon the modulus of rupture of drawn fibers, two frits were selected. These were: (1) a "soft" or readily fusible sheet-iron ground-coat frit of the type ordinarily mixed with a "harder" or less fusible one before application, and (2) an acid-resisting frit for sheet-iron cover coats, which contained a considerable amount of suspended opacifier.

In the sustained-load test, under controlled atmospheric conditions, the modulus of rupture of the "soft" ground coat increased from 4.7 to 7.2 kg/mm², or more than 50 per cent, when the humidity was lowered from 90 to 56 per cent. The temperature was 36 deg. C. Under the same conditions, the strength of the acid-resisting frit increased from 8.4 to 9.7 kg/mm², or about 15 per cent. In the increasing-load tests at 21 deg. C., these frits were respectively about 8 and 22 per cent stronger at 35 per cent relative humidity than at 98 per cent. The stresses required for failure in the increasing-load test were more than twice as great as in the sustained-load test.

When dried over $CaCl_2$ and tested under kerosene, the ground-coat frit was 30 per cent stronger than when stored in the open air and tested under water. The acid-resisting frit was about 50 per cent stronger. Intermediate strengths were obtained when these frits were tested in the open air or under alcohol following storage in open air.

While previous literature contains no reference, so far as the authors know, to variation in the strength of enamel coatings on metal, nor of enamel frits, with atmospheric humidity, previous investigators have found analogous effects for other ceramic materials. In 1927 A. C. Harrison reported that the abrasive



Rubber Lifts a Car

One of the more spectacular exhibits at The B. F. Goodrich Co., Akron, Ohio, building at the New York World's Fair is this demonstration of the strength of the Vulcalock process, by virtue of which a slender cylinder of rubber has sufficient grip to lift a car off the floor. The rubber is bonded to two metal strips by the Vulcalock process, now used in industry on rubber-lined tanks and other industrial equipment.

effect of falling sand on whiteware glazes was dependent upon atmospheric humidity. In 1929 Milligan reported that glass bars on which scratches had been made would sustain certain transverse loads for several days without failure when in a dry atmosphere, but would fail under the same loads in from one to thirty hours when in air saturated with water vapor. Schurkow in 1932 reported that the tensile strength of fused-quartz filaments was greater in air dried with $CaCl_2$, than in "room air."

The results of this study indicate that it is important to control the humidity in tests of the strength of vitreous materials such as glazes and glasses, as well as vitreous enamels, if reproducible results are to be obtained.

A detailed report of this study is contained in the September, 1939, issue of the Journal of Research of the National Bureau of Standards.

Axiflo Pressure Fans. A 20-page catalog describing Axiflo Pressure Fans is now being issued by B. F. Sturtevant Company, Hyde Park, Boston, Mass. The Axiflo Pressure Fans consist of a complete line of highly efficient industrial fans especially designed for performance against wind, duct, filter, and baffle resistance. These fans are said to combine the economy and comparatively low initial cost of the axial flow type of fan with the performance of a centrifugal fan.

The Axiflo Pressure Fan Catalog illustrates many of the models available together with several pages of specification tables to meet standard and special requirements.

A copy of "Axiflo Pressure Fans" will be sent free upon request.

Stow Supplement. Stow Manufacturing Co., Inc., Binghamton, N. Y., is now offering a supplement to the catalog entitled "Stow Standard Flexible Shafts and Flexible Shaft Equipment." This supplement illustrates a number of the burrs in the various sizes and shapes that are carried in stock for immediate delivery. The illustrations appearing in the supplement are actual size and shape. All burrs are made of a specially developed high speed steel.

The Stow Supplement shows only a few of the many hundred burrs available.

A copy of the Stow Supplement will be sent free upon request.

"Lightnin" Side Entering Mixers. Those engaged in the processing industries will be interested in the eight-page catalog which is now being distributed by Mixing Equipment Co., Inc., 1087 Garson Ave., Rochester, N. Y. This catalog is said to contain the most complete amount of information ever issued in one publication on the subject of side entering mixers. A copy of " 'Lightnin' Side Entering Mixers" will be sent free upon request.

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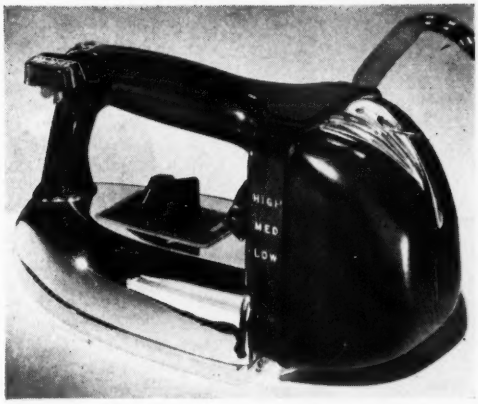
(Right)—The tea container shown here is lithographed in bright orange, with dark green contrasting areas in the band around the middle, the shading of the white lettering, and the background of the bottom diamond panel.

(Photo Courtesy Modern Packaging)

(Photo Courtesy Designers for Industry)

(Left)—A chair from a suite of Chevalier metal office furniture. Beauty and comfort are achieved through graceful proportioning and metal color finishing.

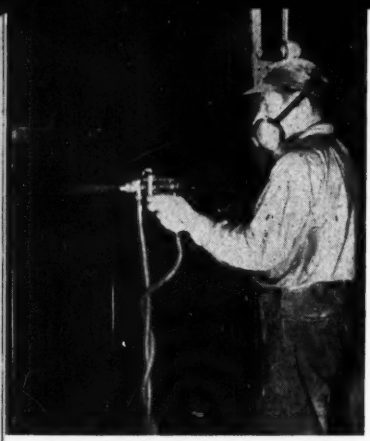
(Right) — The metal base of this modern steam iron is plated with a heavy chromium plating which provides a long wearing surface.



(Photo Courtesy Modern Plastics)

(Below)—The gleaming white porcelain mirror-like stainless steel working surfaces of this all-electrical kitchen are easy to keep clean and spotless.

(Photo Courtesy Nash-Kelvinator Corporation)



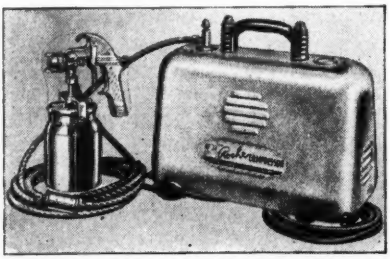
NEW Plant equipment and MATERIALS

Binks Forced Draft Cooled Spray Unit

A portable spray unit incorporating forced draft cooling has been placed on the market by Binks Manufacturing Company, 3114-40 Carroll Ave., Chicago, Ill. Two powerful fans set up a tremendous suction and blowing system within the confines of an enclosed metal case. The scientific placement of intake and exhaust vents is said to permit the entrance of cooling air and does not permit this air to escape until it has passed completely around all parts of the unit.

This spraying unit has been named the "New Roche." The overall weight of the new unit is around 40 lbs. and a single handle on the top of the unit permits handling as easily as one would carry a traveling bag. The case is of heavy gauge steel, built to withstand plenty of rough usage.

The unit is safeguarded by means of a protecting cover. The "New Roche" compressor unit is equipped with a General Electric motor and can be used in any location where either AC or DC current is available.



Binks Forced Draft Cooled Spray Unit

Tygon Tank Lining Material

A synthetic tank lining material to be known as "Tygon" has been placed on the market by The United States Stoneware Company, Akron, Ohio. This tank lining material is said to be suitable for the lining of tanks for handling all types of plating and pickling solutions.

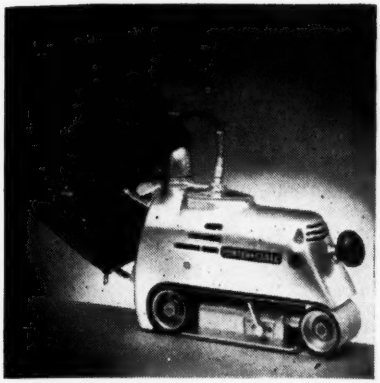
Tank lined with Tygon

Tygon is said to be unaffected by strong oxidizing agents such as concentrated nitric, sulphuric or chromic acids, aqua regia, and so on. Tanks lined with this material are said to have the added advantage of being able to handle first one solution and then another, making it unnecessary to compromise pickling or plating solutions to those which the tanks will handle.

Tygon is generally applied to steel, although it also may be applied to concrete or wood tanks.

Porter-Cable Take-About Sander-Grinder Model BB-10

Several features necessary for increasing production and better finish are incorporated in the Model BB-10



Porter-Cable Take-About Sander-Grinder Model BB-10

Take-About Sander-Grinder which has been placed on the market by Porter-Cable Machine Co., 1708 Salina St. North, Syracuse, N. Y. The Model BB-10 Take-About Sander-Grinder operates at a high belt speed and is said to have increased power. It is balanced four ways, and is easy to handle and to obtain a true finished surface.

The dust collecting system of the Model BB-10 Take-About is said to be more effective. A double fan and ample power is provided, thus making the BB-10 practically dustless. Ventilation has been improved to obtain a cool operating unit.

Belt change is expedited by the new lever control. Correct tension on the belt at high speed is maintained automatically. A silent chain drive delivers maximum power to the point of work and provides a quiet running machine.

Vapor-Liquid-Vapor Detrex Degreaser

For the fully automatic, economical cleaning of cylinder-shaped parts, such as the stators and rotors that are used in electrical refrigerators, the Detroit Rex Products Company, 13017 Hillview Ave., Detroit, Mich., has developed and placed on the market a 1-dip Detrex Degreaser as shown in the accompanying illustration. This degreaser is said to fit into the manufacturing and assembly line and does not require any operator to handle the work.

The conveyor on this machine is a two-strand type equipped with pendant fixtures for carrying the work to be cleaned. The cylinder-shaped work is fed to the degreaser six units wide from a table equipped with guides, and the parts are released by a chain-driven indexed feed mechanism which allows them to roll on the pendant-type fixtures, these fixtures being rigidly guided in both the loading and unloading position.

The cleaning cycle consists of two minutes in vapor, two minutes immersion in boiling solvent, followed by two minutes in pure solvent vapors. As the work is carried out of the solvent vapors, it is perfectly clean, warm, and dry. At the exit position, the work is unloaded smoothly onto the unloading platform as the conveyor changes direction of travel and tilts the work fixtures. The loading and unloading tables are at opposite ends of the machine.

The solvent in the immersion boiling chamber is kept continuously clean by the use of an auxiliary concentrating chamber, the return flow of pure distillate from the wide water jacket condenser to the immersion chamber, and a continuous operating filter applied to the immersion chamber for the com-

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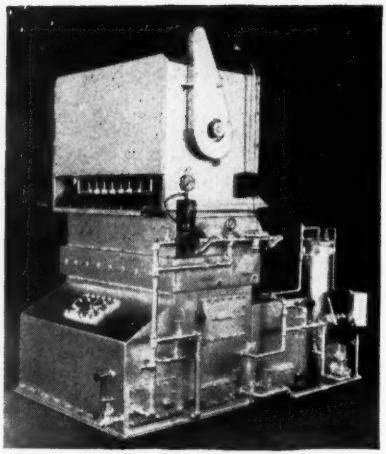

Fully automatic design of Vapor-Liquid-Vapor Detrex Degreaser equipped with concentrator chamber and continuous filter.

plete removal of insoluble matter that is removed from the work.

The concentrating chamber, which can be seen extending out under the unload end of the machine, is heated with steam coils which are welded to a removable clean-out door. The clean solvent immersion chamber which can be seen in the lower center section of the illustration is heated by a steam jacketed bottom, which is equipped with a pressure relief valve. Both the concentrating and immersion chambers have access doors, clean-out doors, gauge glasses, and drain valves. The condensate from the collecting trough inside the machine beneath the water jacket condenser can be piped either to the immersion chamber or the clean solvent storage tank. This storage tank is of sufficient capacity to hold all of solvent from the machine during distillation.

A motor driven solvent transfer pump is used to transfer solvent from drum to machine, from storage tank to immersion chamber, and to continuously circulate the solvent from the immersion chamber through a continuous filter. This degreaser is equipped with a direct acting, self-actuated vapor level control, by-pass piping, valve, strainer, steam gauge, and steam pressure reducer.

This design is manufactured in various sizes depending on production requirements; the machine shown here having approximately overall dimensions as follows: length, 6 ft. 2 in.; width, 6 ft.; height, 8 ft. 10 inches. Work clearances are designed to accommodate six rotors or stators per fixture, the fixtures being adjustable to take care of various widths. The two-strand conveyor has 17 pendant type fixtures spaced on approximately 9⅞ in. centers. The conveyor is complete with motor drive and speed reducer. The approximate weight of the degreaser is 3,000 pounds. At a conveyor speed of 8 in. per minute, this degreaser cleans 300 parts per hour or a production rate of 3,000 lbs. and up per hour.

Lewis-Shepard Carboy Pourer

Lewis-Shepard Sales Corporation, 245 Walnut St., Watertown, Mass., has announced the development of a new type safety carboy pourer. This unit is light in weight and rigidly built, and may

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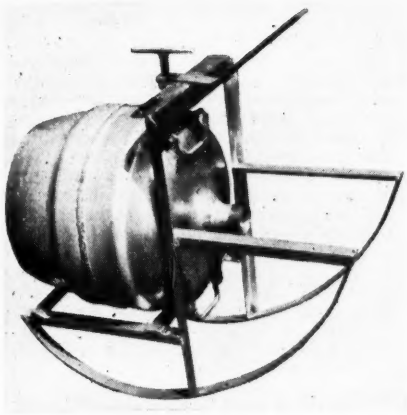

Lewis-Shepard Carboy Pourer

be easily handled by one man, quickly and safely.

The operation of the carboy pourer is very simple. With the carboy resting on its base, the pourer is placed over the top and clamped securely by means of a threaded handle located below the shoulder. An easy pull on the handle brings the carboy into pouring position, resting on a broad rocker base. Tilting the carboy pourer to a still greater angle until it rests upon the handle permits complete drainage of the carboy. The accompanying illustration shows the carboy in pouring position with the cap removed.

Unichrome Rack Coating-W

A rack coating material has been developed by United Chromium, Incorporated, 51 East 42nd St., New York, N. Y., for the purpose of coating plating racks of all descriptions to be known as "Unichrome" and is now being marketed by this company. This material is said to be unaffected by boiling cleaners and plating solutions including chromium. The material itself is said to contain no ingredients which will in any way be harmful to any plating bath into which the coated rack is placed.

Unichrome is white in color so that any uncovered portions of the rack may be readily seen. According to the manufacturer, it will not blister or crack. The recommended procedure for coating racks is to dip the rack into the Unichrome Rack Coating-W. Each coat is subsequently force dried at a temperature of 200 degrees F. The drying operation after each coat requires about one hour. Ten coats are recommended.

Fluorescent Luminaires for Industrial Lighting

Designed for general or supplementary industrial lighting applications where an efficient, low brightness, extended source is required, a new fluorescent lighting unit has been developed by the Westinghouse Electric & Mfg. Company, East Pittsburgh, Pa. Announced are both single and two-lamp units, for either 110-120 or 220-240-volt supply. Since the fluorescent lamp has a high efficiency, heat radiation from an installation is considerably lower than for an incandescent installation producing equal foot-candles.

A steel housing completely encloses reflectors, sockets and controls, making a durable, rugged unit. The reflectors, finished by the Alzak process to assure permanent, high efficiency and easy cleaning, are drawn from No. 18 B & S gauge aluminum sheet. The re-

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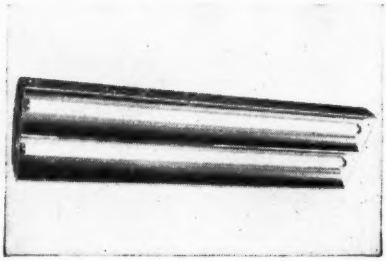
flecting surface has a specular finish for the concentrating type two-lamp unit and a diffuse finish for the spread type single-lamp units. All housings



Westinghouse concentrating type, two-lamp fluorescent luminaire

are finished outside with silver gray hammerloid surfacing, and inside with baked white synthetic enamel.

All housings, except on the 24-inch units, are provided with two-point suspension for attaching to one-half or three-fourths inch conduit. Hooks for chain suspension, safe-change hangers, or adjustable swivels for one-half inch conduit are available as accessories. Swivels are used where it is necessary to tilt fixtures. Knockouts are provided in both ends of each luminaire for end-to-end connections to form a continuous light strip.

Conical Mandrel for Testing Attached Lacquer Films

A conical mandrel for determining the distensibility of attached lacquer films has been placed on the market by Henry Zuhr Company, 187 Lafayette St., New York, N. Y. The apparatus consists essentially of a cone 8 in. in length having a diameter of 1½ in. at the base and ⅛ in. at the small end. A bending mechanism is provided to wrap a finished panel closely around the mandrel. This device is said to permit the elongation of finished coatings from 2.2 to 28 per cent when applied to ⅛ in. thick panels of brass or steel.

The test can be performed by clamping a finished panel and the mandrel in a vise and wrapping the panel around the mandrel manually. The upper surfaces of the wrapped specimens are elongated an amount which is an inverse function of the radius of the curvature of the bend and a direct function of the thickness of panel stock used.

Conical Mandrel for Testing Attached Lacquer Films

Cathanodic Cleaning Process

The Frederick Gumm Chemical Company, 538 Forest St., Kearney, N. J., has placed an alkaline cleaner on the

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Ideal for preparing Iron, Steel, Aluminum, Aluminum Alloys, Galvaneal, Galvanized Iron, etc., for paint finishes. Has been used on more than ten million units.
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market adaptable for both ferrous and non-ferrous articles, to be known as the "Cathanodic" Cleaning Process.

The Cathanodic Cleaning Process when used on steel or ferrous articles is said to eliminate the copper striking operation which normally is used for providing maximum adhesion.

On non-ferrous articles the Cathanodic Cleaning Process is said to remove smut and buffing compounds which sometimes present difficult cleaning problems.

The Cathanodic Cleaning Process is said to be adaptable for cleaning prior to bright nickel plating and other bright plating solutions. It can be used with direct or reverse current or a combination of both. According to the manufacturer, concentrations above six ounces per gallon are unnecessary.

Mar-Nel Galv-A-Niel

A material which prepares galvanized metal for painting, to be known as "Galv-A-Niel," has been placed on the market by Mar-Nel Chemicals, Redford Station, Detroit, Mich. This material can be applied by dipping, brushing, or spraying.

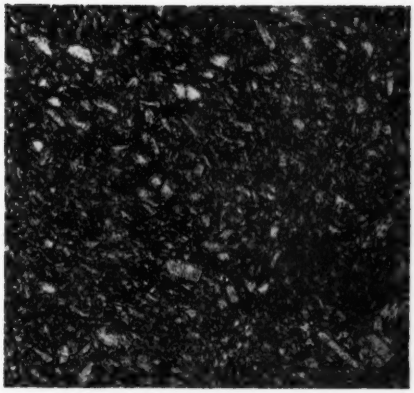
Galv-A-Niel is said to completely prepare the galvanized metal for painting by cleaning the metal of all ordinary dirt, oil, finger marks and so on, and at the same time building up a surface film which produces a bond for the paint.

Galvanized metal as well as any other metal containing a large percentage of zinc metal will take a weld after being treated with Galv-A-Niel. Only one application of Galv-A-Niel is required and no other treatment of the metal or special primer paint is necessary.

Chemically Resistant Ceramic Material

A chemical porcelain for laboratory equipment which is said to be extremely dense, completely vitrified, non-porous and free from voids, blebs and minute pore spaces has been placed on the market by Laboratory Furniture Company, Long Island City, New York. This material is also said to be highly resistant to thermal shock, and can be fired at temperatures in excess of 2,250 deg. F. According to the manufacturer, it is chemically inert to all acids and alkalies with the exception of hydrofluoric.

In order to ascertain the non-absorbing quality of this porcelain material,



Photomicrograph showing the dense, uniform structure of the Laboratory Furniture Company chemically resistant ceramic material. Magnification, 55.

a test was conducted whereby it was attempted to force fuchsine dye into the unglazed body at 100,000 lbs. per square inch pressure over a period of many hours. After the test, there was

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First quality aluminum oxide abrasive grain manufactured in our own electric furnace plant under strictest standards of quality and uniformity. Available in four types (CT, T, B, TB), each of which is most efficient for polishing work within its field of application. Write for Abrasive Grain Data Sheet No. 1 giving complete details. Samples sent of grain sizes you specify.
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not the slightest trace of penetration.

Figure 1 shows a photomicrograph of the chemically resistant ceramic material.

Sellstrom Dependon Safety Shield

A safety shield, to be known as the "Dependon," has been placed on the market by Sellstrom Manufacturing Co., 615 N. Aberdeen St., Chicago, Ill. The window material of the safety shield

Sellstrom Dependon Safety Shield

is synthetic, made to withstand heat, sparks, and acids, and is so removed from the face as to allow sufficient ventilation, and the wearing of prescription glasses or goggles. The window material is available either in clear or tinted effect, and is made in various depths from forehead to chin.

One of the outstanding features of the Dependon Safety Shield is a comfortable headband that can be instantly adjusted to fit any cranium. To the headband is attached the "window" by special friction swivel joints that enable the wearer to raise the window entirely out of the way above his head, and without interfering with spectacles or goggles.

The Dependon Safety Shield is particularly recommended for grinding and chipping operations, work with acids or hot liquids, plating, degreasing, or paint or scale removal.

Protective Coatings for Dowmetal

Protective coatings for Dowmetal designated as Treatments No. 6, 7, and 8 for magnesium alloys have been announced by The Dow Chemical Company, Midland, Michigan.

According to Dow technicians, Treatment No. 7 and Treatment No. 8 provide maximum protection for magnesium alloys against salt water. These two treatments also provide adhesion for subsequent paint coatings. No dimensional changes are involved in the use of Treatments No. 7 and 8, consequently they may be used on parts machined to close tolerances.

Treatment No. 7 can be applied to Dowmetal parts after they have been machined. The treatment imparts a dark brown to black finish and may be used on all alloys with the exception of Dowmetal M.

Treatment No. 8 may be used on all alloys and forms including Dowmetal M. It is stated that this treatment does not affect machined dimensions and leaves machined surfaces with their original lustre. Complete treatment is obtained on all surfaces, including the bottoms of deep holes.

Treatment No. 6 is a die coating produced in water solutions at high temperatures and pressures. The coating can be furnished in colors ranging from yellow, red, blue, and green, to metallic lustres such as bronze and brass. Its greatest use is for decorative treatments and may be used for protecting parts which cannot be conveniently painted.

"Easy" Electric Sander

The illustration shows the "Easy" Electric Sander, a portable all-electric reciprocating motion sanding, rubbing, and polishing machine which has been introduced by the Detroit Surfacing

Oriental Rouge is the ideal rouge for obtaining a mirror-like finish on stainless steel, silver, gold and all other metals. Write for details.

Oriental Rouge Co., Inc.
Established 1901
66 Pine St. • Bridgeport, Conn.

Machine Company, 7433 W. Davison Ave., Detroit, Mich. The sander is adaptable to a wide range of new and refinishing applications on flat, curved,

"Easy" Electric Sander

and irregular surfaces, such as sanding, rubbing or polishing, from fine precision work to rough castings. It can be used on wood, metal, bakelite, granite, slate, leather, or composition surfaces, and on primer, surfacer, or sealer coats, shellac, varnish, lacquer, enamel, and other materials.

Perfect balance, light weight of only 6¼ lbs., comfortable grip, convenient switch control, and smooth reciprocating motion are said to ensure easy, one-hand operation on horizontal or vertical surfaces.

Ample power is furnished by a sturdy, ball bearing, universal motor, operating from any A.C. or D.C. electric light socket. Ball bearing construction is employed throughout and every moving part runs in grease-packed and grease-sealed precision selected ball bearings. Ball bearing thrust with inner and outer races press locked in place eliminates drive shaft shock in all directions. A large fan mounted on the motor shaft provides forced ventilation cooling. A filter installed in the motor cap removes injurious grit and dust from the air before it enters the motor.

One-third of a standard size sheet of abrasive (any kind or grit) fits the "Easy" without waste. An improved type of abrasive holder has been developed which holds the abrasive paper tightly on the sanding pad, thus eliminating loss of cutting action frequently experienced when the abrasive paper is loose on the pad. From one to several pieces of paper can be quickly and securely attached at one time.

Hartzell Propeller-Type Blower

A propeller-type fan blower, with a motor located on top of the blower housing entirely out of the air stream, has just been announced by the Hartzell Propeller Fan Company, Piqua, Ohio. The Hartzell Propeller-Type Blower is said to meet the demand for a propeller-type blower which can be used in moving air at high temperatures and also in the presence of acid fumes or other elements which might damage the motor.

The construction of the unit is extremely simple and correspondingly sturdy. The motor is mounted on top of the blower housing. One side of the platform on which the motor rests is hinged and lock bolts on the opposite

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Our pamphlet will be gladly sent on request.

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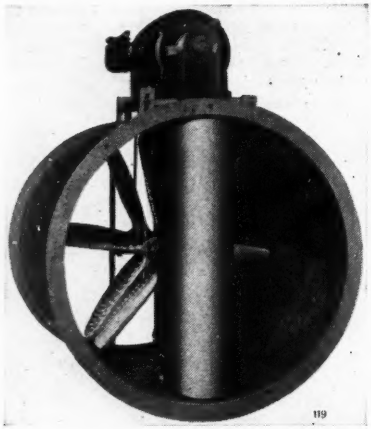
CLEVELAND, OHIO

side can be adjusted to tighten or loosen the belt or to change it.

A V-type belt is used to transmit



Hartzell Propeller-Type Blower

power from the motor to the fan shaft and the belt can be replaced from outside of the blower. The belt is protected inside the blower by a steel guard.

It is stated by the manufacturer that the Charavay Tear-Drop propeller used in the unit represents a new advance in propeller-type fan operation, in that this type of propeller delivers a maximum amount of air.

The Hartzell Propeller-Type Blower is available complete with housing and can be installed with minimum labor in any existing duct. The unit is available in 12 standard sizes, with propellers from 18 in. to 48 in. in length, and can be built in other sizes to meet special requirements.

Multipore Filtration Paper

A porous rubber sheeting developed for various filtration and clarification operations, to be known as "Multipore," has been placed on the market by the Mechanical Goods Division, United States Rubber Company, 1790 Broadway, New York, New York.

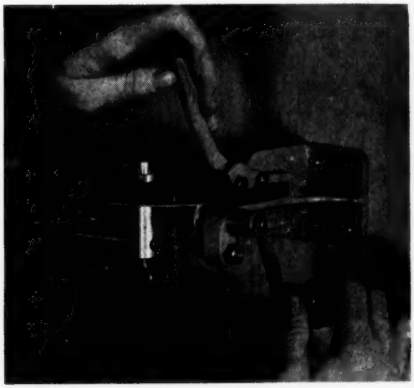
Multipore is made from lastex by a patented process and derives its porous characteristics from the many minute, uniformly spaced holes formed in the sheet simultaneously with the processing of the liquid lastex.

This material is said to offer advantages for processes where flexibility and resistance to the action of corrosive substances are important.

Multipore is available with from 1,100 to 6,400 holes per square inch and with pore diameter of from 0.012 to 0.004 inches. The holes in Multipore are produced before the rubber is vulcanized, permitting variations in the shape and porous characteristics through stretching and other operations before curing.

Nedco Abrasive Disc Cutter

The illustration herewith shows an abrasive disc cutter now being marketed by The Nedco Company, Wal-



Nedco Abrasive Disc Cutter

tham, Mass. This device can be used for trimming the edges of used abra-

Increase Production
Varied shapes and sizes more uniformly Finished
SEND SAMPLE TIME STUDY GLADLY GIVEN.
Packer-Matic Automatic
Polishing & Buffing Machines
Cut Hour Costs
Automatically — today's Method of Finishing
THE PACKER MACHINE CO.
MERIDEN, CONN.

sive discs. It will cut discs any size from 9 in. to 3 in. in diameter.

The Nedco Abrasive Disc Cutter will cut any type of abrasive disc, either fibre or paper back. In operation, the disc to be cut is placed on a center arbor, and the pressure roll pulled down and the crank turned. The unit is simple to operate and is rugged in construction. The cutter knife is made of fine quality steel and can be easily removed.

The Nedco Abrasive Disc Cutter can be mounted on a wall as shown in the illustration.

Maas & Waldstein Codur Enamels

A new line of high speed synthetic enamels, to be known as the "Codur" Enamels, especially suitable for use on metal products subjected to severe service, such as washing machines, refrigerators, kitchen cabinets, and so on, has been developed and placed on the market by Maas & Waldstein Company, 438 Riverside Ave., Newark, New Jersey.

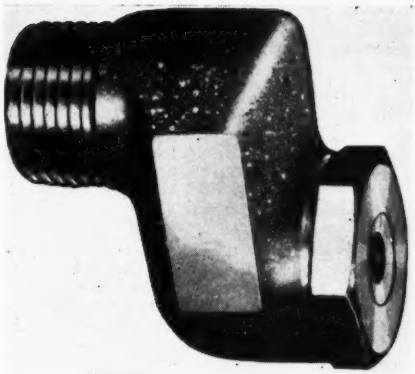
Codur Enamels are said to cut down the time for finishing and thus enable manufacturers to speed up production. They are also said to dry out of dust rapidly and bake in a few minutes to a fine finish that is exceedingly durable and resistant to marring, moisture, and the action of ordinary household chemicals. The baking schedule varies with the temperature, the time required at 325 deg. F. being 15 minutes.

Codur Enamels are furnished in all plain colors and also in colors with metallic lustres. They are said to cover well in one spray coat or can be used over a primer. These enamels are supplied in types suitable for use on all metals and many plastics, including Bakelite.

"Whirljet Angle Type" Spray Nozzle

The illustration shows a "Whirljet Angle Type" Spray Nozzle which was recently placed on the market by Spraying Systems Co., 4922 W. Grand Ave., Chicago, Ill. This type of nozzle is said to produce a hollow cone spray with uniform distribution.

The "Whirljet Angle Type" Spray Nozzle is sturdily constructed and has large passages which are said to make it practically clog-proof. Pipe connection is ⅜ in. male. This type of nozzle is available in six different capacities from 0.5 to 2.5 G.P.M. at 10 pounds pressure. Standard stock construction is brass and other metals can be specified. The "Whirljet Angle Type" Spray Nozzle can be used for air conditioning, air washers, air coolers, chemical processes, or wherever it is necessary to



"Whirljet Angle Type" Spray Nozzle

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ONE PLANT using Metso 66 Cleaner cut the number of baths and rinses just in half. The quicker wetting and complete emulsifying action of Metso 66, special platers' cleaner, save time and expense. Economical, trouble-proof cleaning is worth looking into. Leading platers everywhere are asking for samples of Metso 66.

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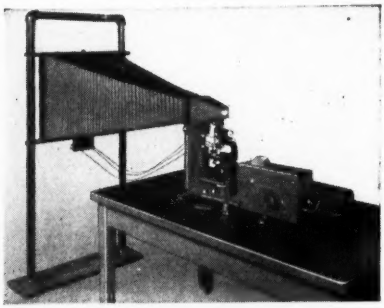
METSO CLEANERS

have a non-clogging, centrifugal type nozzle with pipe connection parallel to direction of spray.

M.S.A. Microprojector

An accurate, rapid, easy method for counting and size estimating of dust particles to be known as the "Microprojector" has been placed on the mar-



M.S.A. Microprojector

ket by Mine Safety Appliances Company, Braddock, Thomas & Meade Sts., Pittsburgh, Pa. The new instrument projects the image of a microscope's field upon a ruled, vertical, translucent screen, providing a magnification of 1,000 diameters for counting and 10,000 diameters for particle size determination.

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For industrial processes where dust control is desirable for economical or health reasons, the M.S.A. Microprojector is said to offer a rapid and accurate method for periodically checking dust conditions. With this outfit, it is easy to tell whether dust collectors, ventilating systems, and so on are performing satisfactorily.

The M.S.A. Microprojector consists of an automatic feed carbon arc lamp, the light from which is reflected by a microscope's mirror up through the field to a right angle projection prism fitted above the eyepiece.

A large leatherette bellows is provided between the prism and the ruled screen, which is 15 millimeters square.

Hommelaya Process of Enameling

A process which provides a method for reducing the number of coats of enamel by using as a first coat an enamel which serves as a ground coat and a cover coat as well, to be known as the "Hommelaya Process," has been developed by The O. Hommel Co., 209 Fourth Ave., Pittsburgh, Pa. In the Hommelaya Process of vitreous enameling, the cover coat and the ground coat have the same coefficient of expansion, so that there is no mechanical strain between the two, and it is therefore feasible to enamel without brushing the edges and applying black edge.

The elimination of black edging is said to be advantageous because the black edge trim requires an extra spraying to apply, as well as brushing to remove the cover coat from the edges.

Besides making it possible to eliminate the black edging, the Hommelaya Process also makes it possible to enamel surfaces which are small and curved. The Hommelaya Process is said to provide a means for enamel finishing on surfaces which have curvatures of less than one-half inch.

Eclipse Type AB Pneumix Mixer

Eclipse Air Brush Co., Inc., 390 Park Ave., Newark, N. J., has placed on the market a clamp type direct drive agita-

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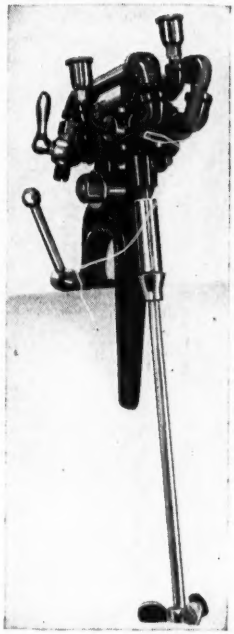
tor to be known as the "Type AB Pneumix Portable Air Mixer." The AB is a small mixer designed especially for use with five-gallon batches of material.



Eclipse Type AB Pneumix Mixer

The AB unit has the regular Pneumix features including variable speeds through air intake control and elimination of fire and explosion hazards through air motor operation.

The mixer can be used on flammable materials and the air throttle control of speed is said to make their use particularly adaptable on jobs where the viscosity changes during the mixing operation.

The Type AB Pneumix is standard with a ⅜-in. chromium plated or stainless steel shaft, 12 in. long, with one 3-in. triple blade chromium plated bronze or stainless steel propeller. Longer shafts and other size propellers made in a variety of metals are obtainable to specifications.

Magnus Electrex Cleaners

A method for the cleaning of metal surfaces for electroplating or other finishes by the use of cleaners to be known as "Electrex" has been developed by Magnus Chemical Co., 208 South Ave., Garwood, N. J. Electrex cleaners are offered in a graded series based upon the Magnus wetting agent Saponex. Saponex is said to have extremely rapid wetting, penetrating and dispersing effects. It provides rapid and thorough cleaning. According to the manufacturer, it is acid and hard water proof and will form no scum by drag-over.

Electrex provides an effective method for cleaning prior to bright plating. It can be used at high concentration and at high current density with reverse current. The usual electrocleaning equipment with steel tank and plate steel cathodes are sufficient.

Steel or copper surfaces can be cleaned in one electrocleaning operation of polishing or buffing compounds, drawing compounds, finger marks, and so on. The solution is maintained at 12 to 16 ounces per gallon and operated at close to the boiling point. The current density should be 40 amperes per square foot. The cleaning time varies from one-half to three minutes, depending upon the amount and kind

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of soil present on the work pieces.

Where the work is heavily loaded with drawing, polishing, or buffing compound, a two-tank cleaning practice is recommended for economy. A preliminary immersion in a hot four ounces per gallon soak solution serves to remove a major portion of the soil. In cleaning brass, zinc, aluminum, and their various alloys, cathodic cleaning is necessary. For these metals, the use of a concentration of six ounces per gallon at 160 deg. F. and a current density of about 40 amperes per square foot is recommended.

Control of proper working concentration is made by withdrawing a sample with a 10 c.c. pipette from a freshly made-up tank. This is diluted with 100 c.c. of water and titrated with a standard acid solution and phenolphthalein as an end point indicator. The c.c. of titrating agent used by the fresh solution gives the standard figure at which the tank should be maintained. The difference between the c.c. obtained in subsequent control titrations and the initial standard indicates the amount of make-up necessary which can be read off from a chart which is supplied with the cleaner.

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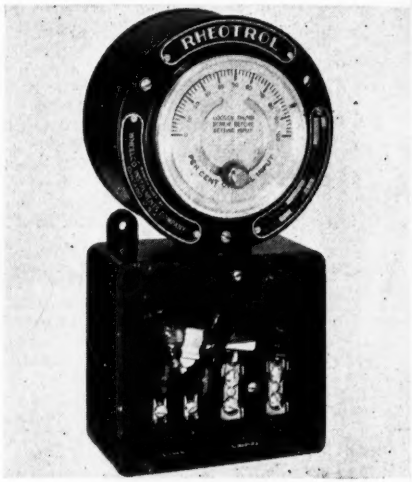
Theo. DeWitt, Pres. R. F. Marsh, Vice Pres.

Wheelco Rheotrol

A wasteless, stepless, and highly efficient manual control for electrically operated furnaces, ovens, heaters, kilns, and so on, to be known as the "Rheotrol," has been placed on the market by Wheelco Instruments Co., 1929 S. Halsted St., Chicago, Ill. The elimination of the step control in this unit is said to place any temperature in the furnace range at the command of the operator.



Wheelco Rheotrol

The Wheelco Rheotrol is a simple, easily adjusted input controller. Adjustments are made by means of variable ratio settings of rotating cams.

The Rheotrol functions to balance the heating rate of furnaces, ovens, heaters, and so on, with varying heat requirements.

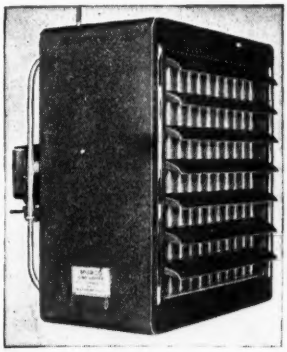
Murco Unit Heater

A streamlined model unit heater to be known as the "Murco" has been placed on the market by D. J. Murray Mfg. Co., Wausau, Wis. The Murco unit is available in 16 sizes to meet various requirements of space heating by either steam or hot water.

The Murco Unit Heater is sturdily built with heating elements of heavy wall copper tubes and fins of the latest design. The condenser is "full

floating" to overcome contraction and expansion.

The unit is equipped with a heavy duty totally enclosed motor, and its general design is such that it fits in perfect harmony with any surroundings. The case is crackle finish, trimmed with chromium strips in front.



Murco Unit Heater

Centri-Merge Dust Collecting Systems. Schmieg Sheet Metal Works, 314 Piquette, Detroit, Mich., has just issued a new catalog giving complete information about air conditioning and dust collecting equipment and featuring the company's Centri-Merge wet system of dust collecting.

The catalog is of the loose-leaf type divided into sections dealing with dust collecting in both centralized and localized systems, spray booths, air washers, parts washers, cyclones, and other special equipment designed and manufactured for air cleaning in industry. The catalog is profusely illustrated with large reproductions of equipment and installations, together with diagrams.

A copy will be sent free upon request.

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Finishing department executives interested in the rapid removal of dirt, grease, grime, and similar deposits from machines by the use of steam cleaning will find useful information in this bulletin now being issued by Oakite Products, Inc., 20 Thames St., New York, New York.

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2. Electroplating Rectifiers
A complete detailed account of copper-oxide rectification for producing low voltage, direct current for electrodeposition. This catalog is being issued by Hanson-Van Winkle-Munning Co., Matawan, New Jersey.

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3. Semi-Automatic Polishing and Buffing Equipment
A beautifully illustrated 8-page bulletin describing semi-automatic polishing and buffing equipment, composition applicators, and so on, is now being issued by Continental Roll & Steel Foundry Company, Industrial Equipment Div., Railroad Ave., East Chicago, Indiana.

4. Eye Protection Equipment
A completely illustrated 8-page bulletin describing a complete line of goggles and spectacles for industrial use. Mine Safety Appliances Company, Braddock, Thomas & Meade Sts., Pittsburgh, Pa.

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5. Custom-Built Finishing Equipment
A 24-page catalog presenting various problems encountered in the cleaning of metal parts and describing the methods and machines used in the solution of these problems. N. Ransohoff, Inc., 210 West 71st St., Cincinnati, Ohio.

---

6. Radiant Drying and Heating
A folder describing clearly the manner in which the Infra-Red Ray System of drying is used. North American Electric Lamp Company, 1020 Tyler St., St. Louis, Missouri.

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7. Plating and Polishing Equipment
One of the most complete catalogs describing and illustrating plating and polishing equipment is now being issued by Munning & Munning, Inc., 202 Emmett St., Newark, New Jersey.

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8. Spraco Painting and Industrial Finishing Equipment
A well illustrated 30-page catalog containing information on Spraco spray painting and industrial finishing equipment which will be of interest to finishing executives. Spray Engineering Company, 120 Central St., Somerville, Mass.

9. Cadmium Plating
A catalog describing the Cadalyte Bright Dip Process of cadmium plating is now being issued by E. I. duPont de Nemours & Company, Wilmington, Del.

10. Rotoblast Cleaning
A 16-page illustrated bulletin on the complete line of standard and auxiliary Rotoblast Cleaning Tables is now being issued by the Pangborn Corporation, Hagerstown, Maryland.

11. Gas or Oil Fired Indirect Air Heater
An interesting illustrated bulletin describing the many new features of the new Despatch Indirect Air Heater. Despatch Oven Co., 622 S. E. Ninth St., Minneapolis, Minnesota.

12. Dust Collecting Systems
An attractive 24-page catalog has just been issued by The Kirk & Blum Mfg. Co., 2816 Spring Grove Ave., Cincinnati, Ohio, which illustrates and describes many K. & B. Dust Collecting Applications installed in numerous industries.

13. Spray Paint and Finishing Equipment
A most complete catalog describing and illustrating spray painting and finishing equipment manufactured by Binks Manufacturing Company, 3114 - 40 Carroll Ave., Chicago, Illinois.

14. Bonderizing
The Parker Process that holds paint to steel and resists rust, known as "Bonderizing" is described in this catalog now being issued by Parker Rust Proof Company, 2172 E. Milwaukee Ave., Detroit, Michigan.

15. Airway Ventilated Buffs
Cool cutting buffs for high speed buffing operations are illustrated and described in a 4-page folder now being distributed by Jackson Buff Corporation, 21-03 41st Ave., Long Island City, New York.

16. Aluminum Oxide Abrasive Grain
A 4-page catalog describing "Borolon," an aluminum oxide abrasive grain for the polishing trade and general industrial use. Abrasive Company, Tacony and Fraley Sts., Philadelphia, Pa.

17. Economical Degreasing
A series of leaflets covering practically every phase of metal degreasing are now being published by Detroit Rex Products Co., 13017 Hillview Ave., Detroit, Michigan.

18. Hovey Spray Equipment
A 4-page catalog describing and illustrating Hovey Spray painting guns and painting outfits is now being issued by Hovey Spray Equipment Co., 1509 Spring Garden St., Philadelphia, Pa.

19. Woven Wood Plating Barrel
Folder describing many features of the King woven wood plating barrel. John King, 48 Springfield, St., Dayton, Ohio.

20. Ross Metal Decorating Oven
A complete description of the equipment for baking decorative coatings on metal is now being issued by J. O. Ross Engineering Corporation, 350 Madison Ave., New York City.

Print plainly in filling out coupon for literature.

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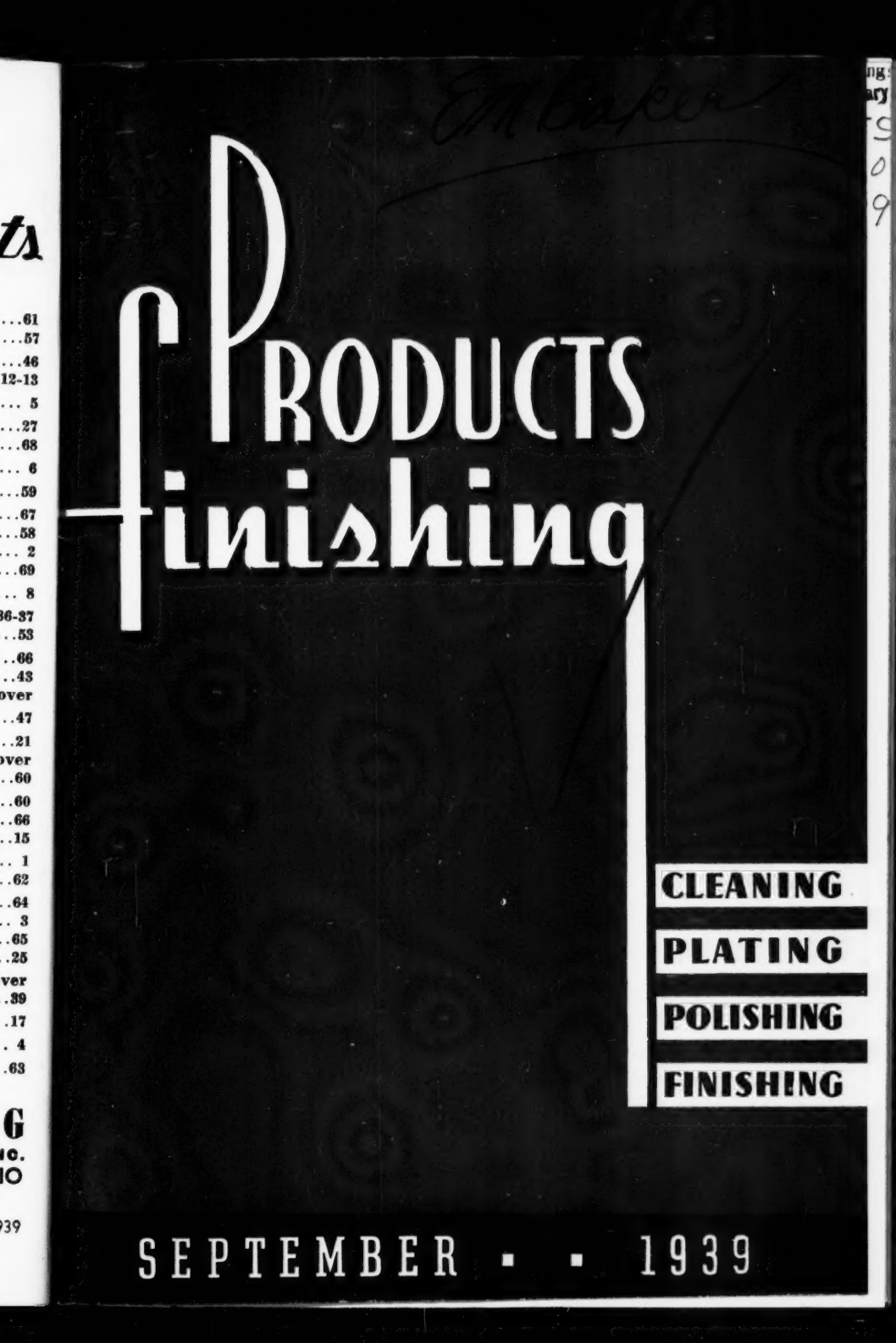
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Why? Because the effect produced by every batch of Rincon-trol is predetermined in its controllable formulation.

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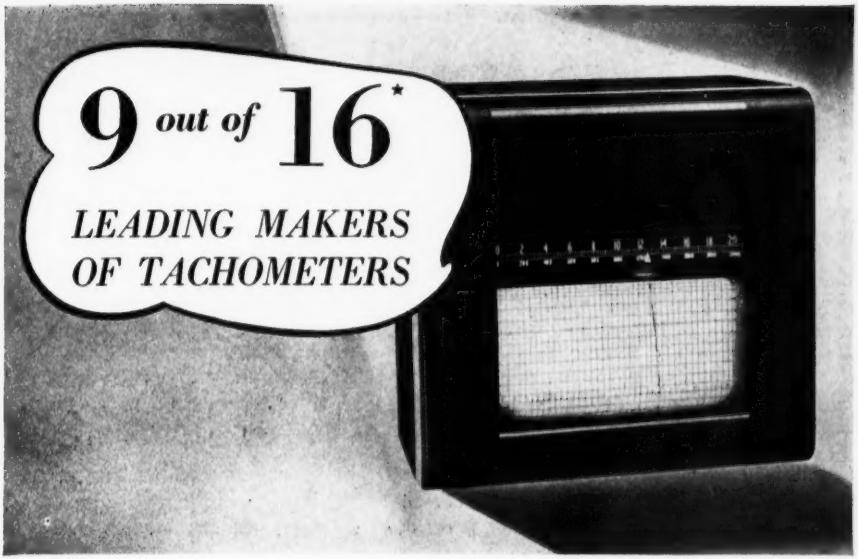

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**9 out of 16 manufacturers rated AAAA in Thomas' Register*

Designed to meet a wide range of speed measuring problems, tachometers are definitely essential "tools" . . . precision instruments that give accurate indication of r.p.m., peripheral, lineal and various other speeds.

As with other products, the different parts of tachometers require cleaning at certain manufacturing stages. If a cleaning operation does not function as it should, trouble develops in the subsequent finishing of parts.

Because thorough cleaning is so important in their plants, NINE out of sixteen leading manufacturers of tachometers use Oakite materials for removing processing oils and compounds, and for other operations.

IT PAYS TO CHANGE OVER TO OAKITE

If you are anxious to improve results and keep costs low either for cleaning, for rust proofing parts in process, for grinding or other operations, you, too, will find "It pays to change over to Oakite" as so many others have done. Put your difficult cleaning problems up to us . . . out of our 30 years' practical experience we are bound to find the right answer.

MANUFACTURED ONLY BY

OAKITE PRODUCTS, INC., 20 Thames St., NEW YORK, N. Y.

Representatives in All Principal Cities of the U. S.

OAKITE MATERIALS & METHODS *Certified* **CLEANING** FOR EVERY CLEANING REQUIREMENT

FRANZITE

A Quick Air-Dry Synthetic That Can TAKE IT!

FRANZITE is a new *Quick Air-Drying* Synthetic Finish of remarkable toughness and flexibility, developed by the Hilo Laboratories.

Specially suitable for those who lack baking facilities, but who want to get their goods out in 24 hours, no longer. FRANZITE sets in 20 minutes, dries to touch in 45 minutes.

Has good hiding and high gloss in one coat . . . extreme adhesion, hardness, mar-resistance . . . good outside durability . . . high resistance to grease, alkali, soap, fruit juices. It retains its color and lustre well with age.

Don't miss this offer! Send in coupon for sample and full particulars about the new FRANZITE *Quick Air-Drying* Synthetic.

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HILO VARNISH CORPORATION
42-60 Stewart Ave., Brooklyn, N. Y.

Gentlemen: We'd like to try a free sample of Hilo FRANZITE Quick Air-Dry Synthetic.

Company .....

By .....

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City and State .....

(PF—September)

CHECK COLOR WANTED

Blue
Red
Green
Ivory
White
Black
Clear

BONDERIZED

TO ASSURE PROTECTION AGAINST RUST

MORE than sixty years of appliance building experience is reflected in the 1939 line of Blackstone Washers and Ironers. Engineered for greater operating efficiency, they appeal to the discriminating buyer.

Contributing to their effective sales appeal is the lustrous "Supernamel" finish, applied over Bonderizing on all important steel parts. Thus, enamel is stabilized, rust is defeated and finish durability is assured.

The effectiveness of Bonderizing on products that will be exposed to corrosive conditions is a well known feature to careful buyers. It is an important point that the alert salesman can use to advantage. Parker Processes help make sales.

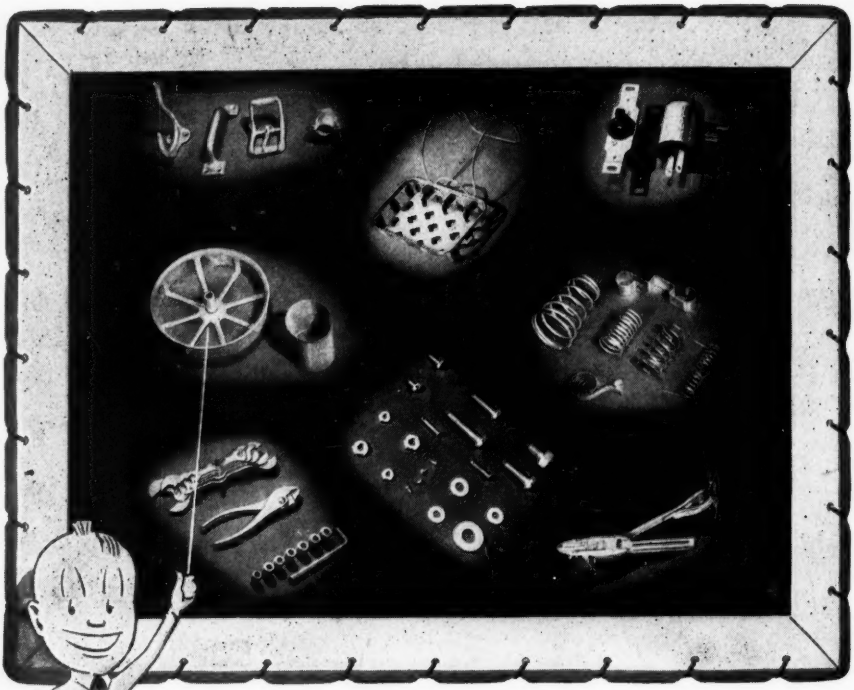
PARKER RUST PROOF COMPANY • 2172 E. MILWAUKEE AVE., DETROIT, MICHIGAN

Send for This Book

It describes Bonderizing in detail and gives the salesman a new talking point that helps close deals.

PARKER *Processes* **CONQUER RUST**

BONDERIZING • PARKERIZING



Question — ARE YOU LOOKING FOR A PROTECTIVE FINISH WITH "EYE-APPEAL"?
Answer — INVESTIGATE UDYLITE-CADMIUM

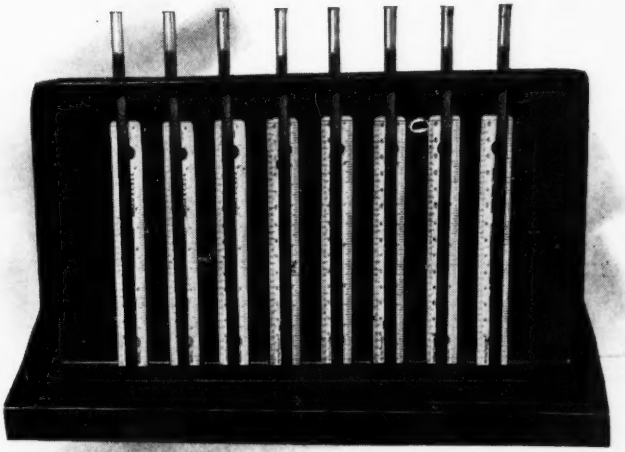
If your product requires an attractive, protective finish as well as an economical one, you should investigate Udylite-Cadmium. • Udylite-Cadmium provides most efficient protection for ferrous and many non-ferrous metals. It is a bright, lustrous finish which is very attractive to the eye. It may be simply and easily applied to a broad range of products by the Udylite process—probably the simplest of all plating processes. • Udylite-Cadmium costs little. The present price of cadmium metal, never lower than today, puts Udylite-Cadmium in the lowest price bracket among protective metal finishes. • Investigate Udylite-Cadmium. Learn more about the combined advantages of efficient rust protection, attractive appearance and easy application at a competitive price. Every facility of The Udylite Corporation, the firm which originated commercial cadmium plating, is yours to command.

THE UDYLITE CORPORATION

1651 E. GRAND BLVD., DETROIT, MICH.

NEW YORK—30 E. 42nd St. **CHICAGO**—1943 Walnut St. **CLEVELAND**—3756 Carnegie Ave.

THIS "PIPE ORGAN" PLAYS SWEET MUSIC



for users of "TP" polishing grain

●Sweet music to any polisher is a grain that is wetted quickly and thoroughly by the glue . . . that packs closely and easily on the wheel . . . that holds strongly in the dried glue. Grain like that has a high capillarity characteristic. It speeds up the work, lowers costs, does a better all around job.

That's the kind of grain you get in Aloxite Brand Aluminum Oxide "TP" . . . thanks to our "pipe organ" testing machine. The eight glass pipes or tubes of this device accurately measure and compare the capillarity characteristics of polishing grain . . . the rate at which the grain is wetted by the glue. Every batch of Aloxite Brand "TP" *must* show high capillarity. You can count on each grain to hold firmly until it has done its full quota of work . . . there is no shedding of loose grains to scratch or mar the work.

High capillarity Aloxite Brand "TP" Polishing Grain is made of specially treated, tough, long-lasting aluminum oxide. It is always uniform in size and shape . . . without flats or splinters. Be sure to specify "TP" if you want more, better and faster work, with less grain and glue . . . if you want to hear the sweet music of real economy.

Aloxite Brand "TP" Grain has highest surface capillarity

CARBORUNDUM
REG. U. S. PAT. OFF.
ABRASIVE GRAIN AND PRODUCTS

THE CARBORUNDUM COMPANY • NIAGARA FALLS, N. Y.

Sales Offices and Warehouses in New York, Chicago, Philadelphia, Detroit, Cleveland, Boston, Cincinnati, Pittsburgh, Grand Rapids

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EGYPTIAN
FINISHING LACQUERS

Finishing Lacquers for use over colored enamels. Tough, light colored lacquers which withstand buffing to extremely brilliant high quality finish. . . . Finishing Lacquers for use directly on highly polished metals, giving extreme toughness and flexibility as well as beautiful brilliance and lustre. . . . Finishing Lacquers for use over enamels and exposed highlights, giving maximum protection to both.

Egyptian Finishing Lacquers impart beauty and depth of film which add to the quality of your product. They are impervious to various atmospheric conditions and are extremely resistant to handling, buffing, tarnishing, and marring. Egyptian Finishing Lacquers are extremely durable and may be either air-dried or baked. Write for particulars.

EGYPTIAN FINISHES

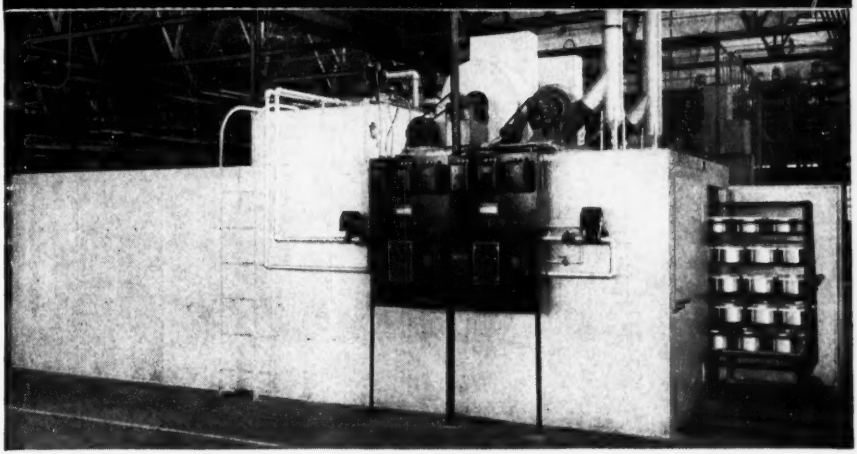
In addition to hundreds of Clear Lacquer formulations made to meet standard and individual requirements, we also make a complete line of pigmented lacquers and Synthetics. Ask for details.

THE EGYPTIAN LACQUER MANUFACTURING COMPANY

ROCKEFELLER CENTER

NEW YORK

KIRK & BLUM
INDUSTRIAL OVENS



Kirk & Blum Ovens, specially designed, engineered and installed for Victor Electric Products, Cincinnati, Ohio. This installation consists of two Truck Type Ovens, each a separate operating unit. Ovens accommodate four trucks at one time, have full automatic control, and operate from 200 to 450 degrees. Trucks move in one end and out the other every 10 minutes.

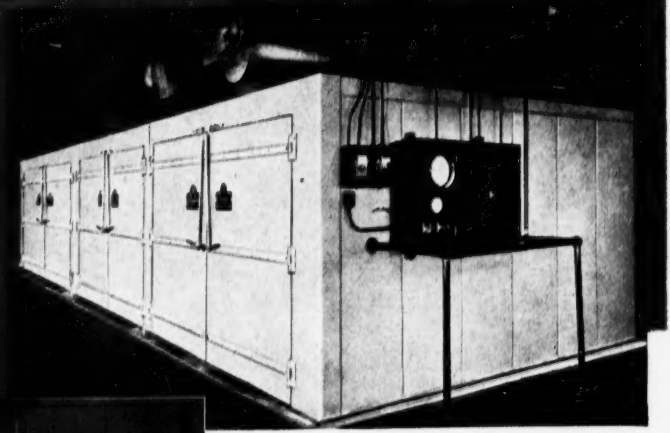
KIRK & BLUM Industrial Ovens meet modern demands for faster production, improved finishes, lower operating costs, savings in floor space. Maximum safety is provided through the use of latest approved Safety Devices --- automatically controlled ignition and timers, automatic heating equipment, duct systems of ventilation, explosion locks, etc.

Our Engineers have solved the drying, baking enameling problems for many leaders in a wide diversity of industries. Details of this service and valuable data on ovens and equipment mailed on request. Write today!

THE KIRK & BLUM MFG. CO., 2816 Spring Grove Ave., Cincinnati, Ohio

Chicago Representative: C. P. Guion, 1661 N. Milwaukee
Pittsburgh: Bushnell Machinery Company, 311 Ross Street
Louisville: Liberty Eng. & Mfg. Co., Inc., 1450 S. 15th St.

OVENS



The illustration above shows a Mahon automatically controlled gas fired oven installed in a plant of the Pearl Company of St. Louis, St. Louis, Mo. The standard Mahon Safety and Temperature Control Cabinet is illustrated below.

...Thoroughly Engineered Automatically Controlled

In this highly competitive era efficient oven equipment is very essential in any business where finish and product appearance is important. That is why hundreds of manufacturers ever year turn their entire oven problem over to Mahon . . . they know that Mahon installations are thoroughly engineered and automatically controlled to meet the specific requirements in each individual case. You, too, can profit by the years of practical experience and the technical knowledge available to you through the Mahon organization. Call in a Mahon engineer today—consultation will not place you under any obligation.

THE R. C. MAHON COMPANY
DETROIT — — CHICAGO

Designers and Manufacturers of Metal Cleaning Machines, Rust Proofing Machines, Hydro-Filter Spray Booths, Ovens of All Types, Hydro-Foam Dust Collectors, and Many Other Units of Special Production Equipment.

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